RESOURCE CONSERVATION AND RECOVERY ACT PART B PERMIT APPLICATION

UNITED TECHNOLOGIES CORPORATION
PRATT & WHITNEY
400 MAIN STREET
EAST HARTFORD, CT 06108

EPA ID NO: CTD 990672081

VOLUME II

PREPARED BY

LOUREIRO ENGINEERING ASSOCIATES
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PLAINVILLE, CT 06062
COMM. NO. 971-10

NOVEMBER 12, 1990

STATE OF CONNECTICUT
DEPARTMENT OF ENVIRONMENTAL PROTECTION

July 19, 1991

NOTICE OF DEFICIENCY

NAME: Pratt + Whitney
I.D. NO.: CTD990672081
FILE LOC.: R-43
OTHER: [illegible]

Mr. Ralph Weiss
Director of Facilities & Services
MS-102-13
Pratt and Whitney Aircraft
400 Main Street
East Hartford, CT 06108

RE: Part 'B' Permit Application
Pratt and Whitney Aircraft
400 Main Street
EPA I.D. CTD 990672081

Dear Mr. Weiss:

The Connecticut Department of Environmental Protection has conducted a review of the Pratt and Whitney (P&W) permit application under Section 22a-449(c) of the Connecticut General Statutes for a permit to store hazardous waste. A review of the preliminary application has been made to determine if the information submitted is complete under Section 22a-449-110 of the Connecticut Hazardous Waste Management Regulations.

We have determined that the application is incomplete and we have specified in our attachment to this letter the additional information needed.

Further processing of your permit cannot begin until this information is received. Please submit the necessary information within 45 days of receipt of this request.

After the Department of Environmental Protection determines that the application is complete, any additional information request will be limited to that necessary to clarify, modify or supplement previously submitted material.

Your response to our comments may be in the form of a totally revised complete Part 'B' permit application or revised pages which can be inserted into the original Part 'B' application submitted.

If you choose to submit pages, please provide the following information:

1. Page numbers should be shown for the entire application;

2. For each page submitted, indicate if it is a revision to a page in the original submitted or a new page not contained in the original submittal; and

3. Date or code each page, for example 32(R-5/7/85) means page 32 revised May 7, 1985.

NOD (continued)
Pratt and Whitney

All revisions to your Part 'B' application must include a new certification with the appropriate signatures as required by Hazardous Waste Management Regulations 22a-449(c)-110 and 40 CFR Section 270.11. Additionally, if you wish to claim confidentiality on any new information, please submit a claim in accordance with Section 1-19 of the Connecticut General Statutes.

In your response to this Notice of Deficiency (NOD) please submit a response summary letter which will reference each Notice of Deficiency comment, and will include a brief summary of the comment response, referencing where each response is included in the revised Part B application. If P&W feels some of the comments are already adequately addressed in the first version of the Part B application, this cover letter should indicate where the comment was addressed and briefly describe how the original submittal meets the objectives of the comment.

If you have any questions relative to this determination of deficiencies noted, do not hesitate to contact Lynn M. Clune at (203) 566-4869.

Sincerely,

David A. Nash

David A. Nash
Director
Waste Engineering and
Enforcement Division
Bureau of Waste Management

DAN:LMC:lmc
enclosure - Notice of Deficiencies

cc: John Podgurski - USEPA, Region I, Boston
Bryan Kielbania - Pratt and Whitney

NAME: Pratt & Whitney
I.D. NO.: CTD990672081
FILE LOC: R 11
OTHER: Vol II

Notice of Deficiencies

Pratt and Whitney Aircraft
United Technologies Corporation
400 Main Street
East Hartford, CT
EPA ID. No. CTD 990672081

1. The new hazardous waste storage facility may be operated as a replacement facility as long as the changes do not amount to reconstruction and the existing capacity is not exceeded; and

2. Any construction conducted for the new facility is done at risk and may result in changes due to DEP concerns or as a result of permit public notice comments.

A. Part A Application [270.11(a) and (b)]

1. The land type is described as County land but United Technologies Corporation is listed as the owner. Explain the discrepancy.

2. The operator/owner information is not completely filled out.

3. There is no real description of the waste just inclusions with previous lines. Verify the correct line numbers for these inclusions. Update the list of hazardous waste codes to include all codes listed in the Part B application and make sure to include all wastes received from off-site facilities. The process design capacity for storage must reflect the actual maximum storage capacities available at the facility. The maximum capacity for storage must reflect the total of all storage areas (existing and proposed).

4. The Part A application is unsigned by both the owner and the operator. The revised Part A to be submitted must bear the original signature of the owner/operator.

5. Pratt and Whitney must also include a copy of their applicable NPDES permit with the copies of the other applicable permits already submitted.

6. Verify that P&W does not have any additional RCRA regulated activities at their facility that should be addressed in the permit application.

B. Facility Description

General Description [270.14(b)(1)]

1. There is a great deal of overlap between the use of the terms "site", "facility", and "complex". Keep specific to the Main Street facility, as this is the subject of the permit application. The Part B application should contain verification that the only RCRA regulated units to be permitted are the Waste Storage Facility (WSF), CWTP-5 and CWTP-6 (e.g. - there are no incinerators, boilers for burning, etc.). Provide additional information for all fuel burning activities.

2. Provide a brief description of the processes involved in the generation of hazardous waste from all facilities which will be storing waste in the regulated units. Separate out all of the off-site facilities with a general descriptions of the facility and the types of wastes received from them. Verify how the laboratory waste are similar to the other wastes handled and any special provisions made for these wastes.

3. Verify that off-site wastes will only be received and stored in permitted storage areas. Clarify where these wastes are going to be received. Once the final permit is issued no off-site wastes are allowed to be stored in CWTP-2 tanks or in any other non-permitted area. Clarify in the permit application what will happen with the tanker truck wastes if the WSF is not operational for tank storage when the final permit is issued.

Topographic Maps [270.14(b)(19)]

1. Loading and unloading areas are not shown. Sewer storm drains must be shown in conjunction with these areas.

2. Access control to the facility is not shown. The access and internal roads shown are unclear.

3. There is no mention of either off-site withdrawal wells or upgradient wells. Pratt and Whitney must identify the location of all wells within a "1/4" mile of the regulated units.

4. Not all of the structures and buildings are clear, only those in the immediate vicinity of the CWTP.

5. There are no map dates listed on Maps B-1, B-4, B-5, and B-7. The map orientation is missing from Map B-3.

6. Briefly describe the information provided on the wind rose graph; the principal wind directions and associated wind speeds.

Flood Plain Standard [270.14(b)(11)(iii)]

Map B-7 is not sufficient to show that the facility does not lie in a 100 year flood plain. This can be demonstrated by using a Federal Emergency Management Agency (FEMA) map for East Hartford, Connecticut.

Traffic Information [240.14(b)(10)]

1. Elaborate on the traffic patterns for all on-site wastes from point of generation/satellite accumulation areas to the WSF, CWTP-5 or CWTP-6.

2. Discuss the traffic patterns used. Elaborate on the traffic routes from plants using major collector routes and if these vehicles pass by or near schools, hospitals, etc.

3. Provide the volume on <u>all</u> truck traffic on-site, not just the traffic related to hazardous waste shipments only. Include the number and type of vehicles.

C. Waste Characteristics

Chemical and Physical Analysis [270.14(b)(2), 264.13(a)]

The information contained within this section of the Part 'B' permit application is perhaps the most important in the development of the permit. It is necessary that the waste data being presented be complete and reflect that the facility knows what information is needed to operate the facility properly and has a program in place to gather the necessary information.

In order to properly operate their facility Pratt and Whitney must identify, handle, store, treat, and dispose of all hazardous waste in a safe manner. Pratt and Whitney must insure that all wastes are (1) compatible with the containers and containment structures they are stored in, (2) compatible with the surfaces they are stored on, (3) compatible with co-existing waste and costored "other materials", and (4) fully characterized whenever changes occur in waste streams or in the processes which generate a waste stream.

1. The waste descriptions for each general grouping lists "Others". What are these others and are they listed elsewhere? In the listing for the laboratory chemicals the numbers U054 and U165 are listed with no chemical substance names. Verify that these numbers are correct and supply their chemical names.

2. In addition to the Pratt and Whitney waste numbers, the EPA hazardous waste identification number (40 CFR 261 Subpart C and D) needs to be listed for each constituent and duplicate numbers should be deleted unless there is clarification as to why they are necessary. Elaborate on any wastes from process streams that are commingled with any other waste streams.

3. Any waste streams which have been determined to be incompatible in accordance with the methodology in the EPA document 600/2-80-076, A Method for Determining the Compatibility of Hazardous Wastes, but has been identified for commingling in the Part B permit application should include a statement addressing its compatibility and identify the appropriate test procedures utilized to verify this compatibility and the maximum concentration if applicable. These incompatible chemical Reactivity Group Numbers (RGN) should not be included in the group listing unless it is verified that it is compatible with all other chemicals in that group.

4. All waste streams should be broken down into compatibility groupings in accordance with the storage locations (e.g. - Acids, Ignitables, Organics, etc.) in order to be more easily identified and handled. In Table 5 clarify the meaning of "Category Designation" - is it a site designation, compatibility designation, etc.?

5. Re-evaluate the separation of incompatible laboratory packs into separate storage areas, since the use of overpaks is not permissible in this manner. Overpaks may be used but all waste materials within their containment must be compatible. All lab packs shall also contain only compatible waste materials. Elaborate on any repacking that may be required to assure this and where repacking will take place.

6. In Table 6 of Appendix C-5 each chemical was assigned a Hazard Rating for Health, Reactivity and Flammability. Verify all procedures used when handling chemicals with a health rating of greater than 3, a reactivity rating of greater than 2, and/or a flammability rating of greater than 2. In addition, verify that no hazard ratings are available for those chemicals that have not been assigned them. This is very important for the determination of allowable chemical storage.

7. Table 7 contains a listing of container compatibilities, verify that all drums being used meet all Department of Transportation (DOT) requirements. Provide verification of DOT approval for P&W 375 gallon transporters and specify type and/or size of transporter that is replacing P&W transporters.

8. For all off-site wastes that are being bulked in tanks, please provide detailed information to ensure that the appropriate RCRA concerns are adequately addressed (e.g. - compatibility, waste stream constituents and constituent ranges, acceptance and rejection criteria for bulking waste, etc.).

9. Specify how accumulated liquids in sumps or collection areas are analyzed to determine their compatibility group.

Waste Analysis Plan [270.14(b)(3), 264.13(b) and (c)]

The Waste Analysis Plan (WAP) should be a stand alone document. It must describe the methodologies for conducting the analyses required to properly store hazardous waste. The information needs to be complete, organized and presented in an efficient manner. In addition, the WAP should be easy to understand and easy to implement.

All Land Ban Waste must be addressed in the WAP as required in 40 CFR Section 268 Land Disposal Restrictions.

The following specific areas of concern will outline the information which is needed to bring your Part B permit application WAP into compliance with RCRA standards. When addressing the following comments concerning the waste analysis plan, please submit this information so that it clearly describes which wastes are on-site and which wastes are from off-site sources.

A. Parameters and Rationale [264.13(b)(1)]

1. Explain the rationale for the selection of the Minimum Parameters and Possible Additional Parameters listed in Section C Table 1 and Waste Screening Parameters in Table 2. The analysis must include, at a minimum, all the information that must be known to properly store all hazardous waste.

2. The Part B permit application must include all rejection and acceptance criteria for all parameters. This criteria should include the acceptable range of hazardous waste constituents along with the rationale for selection.

3. Elaborate on Quality Control/Quality Assurance procedures needed to ensure that samples are accurate and all equipment is decontaminated prior to, between, and after collection. Also elaborate on those procedures needed to determine the accuracy, precision and overall integrity of the analysis program.

B. Test Methods [264.13(b)(2)]

1. Separate the test methods to be used for the screening of both on and off-site wastes. This should include all the parameters, their rationale, and their ranges.

2. Describe when and how often the oils are classified/ reclassified into their respective categories. Provide all EPA waste codes assigned to oils. Clarify if it is done by testing or by process knowledge. Describe how they are tested to ensure that no PCBs are present.

C. Sampling Methods [264.13(b), Part 261 Appendix I]

1. The Waste Analysis Plan must specify a sampling protocol for each waste stream that will yield a representative sample for analysis. Specify how tanker truck shipments will be sampled and tested before being added to any regulated storage tank. In particular, if the trucks are multi-compartmented each compartment should be sampled.

2. Describe the sampling procedure for laboratory packs. The information given does not adequately describe details for this procedure. Both on and off-site waste must be addressed in detail. All incompatible waste must be segregated at all times during storage of both on and off-site wastes. Therefore the use of overpaks to contain incompatible wastes is impermissible.

D. Frequency of Analysis [264.13(b)(4)]

1. The applicant should develop a scheme for reviewing initial waste analysis, and on an as needed basis. At a minimum each waste stream should be recharacterized annually, and whenever raw products or process changes occur.

2. The frequency of analysis is used to determine if the there was a known change in the waste stream. Describe any methods used to "spot-test" these streams to assure that there were no unexpected changes in these wastes.

E. Additional Requirements for Ignitable, Reactive or Incompatible Wastes

1. The intent of this section is that the owner/operator of a hazardous waste facility describe methods used to meet additional waste analysis requirements necessary for storing of ignitable, reactive or incompatible wastes. Specifically, refer to 40 CFR Section 264.17 (b)-(c), and 264.177 and provide documentation of compliance.

2. The review of wastes for compatibility should be done with respect to the chemical constituents in the wastes, not merely their hazard classes. Often, even wastes within the same class can be incompatible. Also, wastes in hazard classes that are typically compatible may be incompatible because of specific constituents they contain.

3. Regarding co-storage of raw materials and other wastes, all chemicals stored in designated hazardous waste storage areas must be assessed for compatibility with all hazardous waste. Their impact on secondary containment, storm water and surface compatibility must be assessed. Separation of incompatible materials by a dike, wall, berm or trench is necessary.

4. Design and operating features must specify how leaks of incompatible materials will be prevented from mixing. Incompatible wastes may be stored in the same area provided they are separated by a wall, curb, etc. clearly shown on design drawings. Permittees must specify that hazardous waste will not be placed in an unwashed container previously holding an incompatible substance. (Also see 40 CFR Part 270.15 (d)).

5. Provide certification from a qualified, independent, Conn. registered, professional Fire Prevention Engineer that all regulated storage areas/buildings meet all NFPA requirements for the storage of ignitable wastes.

F. Restricted Wastes

Describe in greater detail the specifics for handling, treating, and disposing of restricted wastes. Any alternative treatments standards used should be documented.

G. Industrial Waste Tracking System

The Industrial Waste Tracking System (IWTS) should be explained more in depth. It sounds almost completely similar to how the waste is now tracked. How is the waste tracked? Is it logged into a computer, are containers scanned when they reach a new area, ...? Who sends the accumulation reminders, how are they sent, when are they sent, ...? Specifically:

1. Submit a copy of the pre-printed label, internal manifest and a scenario for how both on- and off-site waste is tracked.

2. Verify how and what wastes are tracked (both on and off-site). Verify if waste can be tracked to the point of generation/ satellite accumulation area.

3. Clarify all information provided with the receipt of wastes from off-site facilities. This information should be able to tell exactly what is in any drum at any time, no matter where that drum is located.

4. Verify that all dated information included on the pre-printed label will be included as necessary before any containers are released to any department.

5. Verify that any containers placed in storage will be marked with a container full date regardless of whether or not they are full. Otherwise provide a separate space for listing the date received into storage.

D. Process Knowledge

The Part B application lacks the necessary information to ensure that all wastes, both on-site and off-site, are safely and effectively transferred to their respective storage areas.

The Part B application should indicate that appropriate waste release control measures have been incorporated into the design of the facility's open space as well as the facility's storage areas to prevent any release of materials transported on-site from flowing or migrating off-site and contaminating off-site properties. The measures should also indicate how released material is prevented from entering any on-site open water streams. Verify that all wastes entering the Main Street facility will be in box trailers (wastes received from Pent and Colt Street, especially) and that all waste containers can be and are covered when not in use. Are any of the incoming shipments delivered to the regulated areas comprised of raw materials? If so, the raw materials are to be treated as any waste delivered into the area (e.g. they must be stored with compatibles until such time as they are removed from the WSF). Provide separate listings for all waste and raw chemical materials.

The Part B application should also address how the storage areas in CWTP-5 and CWTP-6 are to be decontaminated between use for storing different component groups. In addition to this, all containment calculations should be shown. These calculations shall include all negative volumes from all pallets, transporters, tank legs, pumps, or any other space taken up in the containment area. Verify that there is secondary containment and leak detection for all ancillary equipment (e.g. - overhead piping, underground piping, interconnecting piping, etc.).

Containers and Container Storage Areas (CSA) [264.171-174, 264.175(b),(d); 270.15(a),(b)]

1. Clarify for each of the drums and transporters pumped into the storage tanks that there is a separate pump for each compatibility group and that transporters and drums in the staging area are separated by compatibility groups. Verify how long these containers are kept in the staging areas before they are put into either container or tank storage areas, whether off-site wastes will be held in the staging areas before being put into bays, how they are separated for incompatibilities in the staging areas, and provide all secondary containment calculations and profile drawings necessary for each staging containment area.

2. Elaborate on the type of DOT transporters to be used in the future and when they will be implemented into the facility. Show any applicable documentation that the P&W transporters now in use meet all DOT requirements. Verify the types of drums used and that they also meet all DOT requirements. Describe the type of container repair and cleaning that are to be done in CWTP-5 and if these "cleaned" containers are to be re-used.

3. Verify if drums can be handled separately or if they will be transported on a pallet at all times. If a pallet will always be used, elaborate on how the drums are prevented from falling. Clarify the procedures for handling all containers to prevent rupturing or leaking.

4. P&W must ensure that those CSA's having adjacent storage bays are separated by a dike, wall, berm, trench or other device that has the ability to prevent wastes from discharging horizontally from a punctured tank or container and co-mingling with incompatible waste materials in another storage area.

5. Specify for each storage bay in each CSA the dimension, the maximum capacity that can be stored there, that all waste stored together have been determined to be compatible, and any berms, dikes, speed bumps, etc. that are used to keep the waste from co-mingling at all times, and how leaked waste is gathered and removed from each area.

6. A statement must be made that the surfaces in each existing/future storage area is free of cracks or gaps, and impervious to migration of waste or waste residues. This statement must also include any secondary containment sumps and their ancillary piping Expansion joints should be sealed with water stops or by some other means so as to prevent migration of waste residues to subgrade. Provide all necessary secondary containment calculations and profile drawings including all negative volumes.

7. Elaborate on what types of wastes and the quantities which will be brought on-site by a pick-up truck. State whether this is included within the conditions of your transporter permit.

8. Specify how containers are to be arranged in each of the CSA's in order to provide access to and easy removal of any leaking containers. Also include all test methods for the determination of free liquids in all containers placed in storage.

<u>Tank Systems [264.190(a), 264.191-264.195, 264.198, 264.199, 270.14(b)(1), 270.16(a)-(j)]</u>

1. Verify specifically how the storage tanks are to be labelled, will it be as depicted in the floor plans. Explain the discrepancies between the tank numbers in the floor plan and the West Bay Mezzanine plan in Map 3 of the Design Report.

2. Verify that all buried piping has secondary containment (double-walled piping). Elaborate on what special management practices will be used with all the overhead piping. (Note: does it need special practices or just not over drains or gradients to drains) Elaborate on how these pipes are contained. Explain why the tanks have interconnecting piping. Clarify if there is a shut-off valve between them to prevent contamination from spreading between tanks.

3. Verify what industrial waste are handled at the treatment plant and any steps they go through (e.g. neutralization,...) before they are actually treated in the NPDES wastewater treatment system. Elaborate on if these wastes are hard piped by dedicated piping to specific tanks or if the piping interconnects. How is cross contamination prevented? Describe any and all safety problems associated with treating these wastes. Clarify what the "final treatment plant" for the metals is.

4. The Design Report mentions the different methods of disposal that Pratt and Whitney uses. Clarify what is being pumped into Building E, how it is pumped there, and determine if this should be included with the other methods of disposal. Clarify what the "the pumping facilities at Willow Street" are and what they entail.

5. Show compatibilities for any tanks that can discharge horizontally into another containment area or any truck pads that handle more than one type of waste. Elaborate on the number of trucks that will be in a truck pad at one time and if rainwater can enter any of the truck pads when they are in use, will this be a compatibility problem, and if so, how will this be handled.

6. Assure that P&W's waste storage tanks and all tank procedures will be in compliance with all applicable regulations from 40 CFR Part 264 Subparts AA and BB.

7. Verify that all wastes are compatible with the lining of the tank in which they are to be stored. In addition, verify that all Subpart J requirements have been met or provide the necessary information to meet these requirements.

<u>Design Report Mapping</u>

<u>1. Map - 3</u>

a. In the Design Report there is mention of a second fork lift ramp but none is depicted in the design maps. Explain this discrepancy.

b. Depict in the mapping where the remote control cameras are to be placed for each area. Elaborate on which doorways will be used for everyday traffic and which will be used only in emergencies. How is unauthorized entry to these areas controlled?

c. Mezzanine Plans:

- Elaborate on if the floor structure is completely supported by the tanks or is there some other means of support.

- Opening in the flooring should be more adequately depicted.

d. Elaborate on the area marked "Fire Protection".

e. Explain how any spills occurring on the fork lift ramp would be contained so as to prevent liquids from running off the open side.

f. Provide information/drawings elaborating on exactly how the drums will be arranged within each container storage area and the access to all containers in the area.

g. Elaborate on how container storage areas will be marked to provide information on what wastes can and can not be stored there due to incompatibilities, containment capacity, etc.

2. Map - 4

a. Explain the grid areas that are shown on this map that are next to and opposite the tanker pad doorways.

b. The map depicts a slanted roof while the report states that the roof is flat. Explain this discrepancy.

3. Maps 5 and 6

a. Provide information to assure that no cross-contamination occurs within the interconnected pipes, the transporters and the sumps, i.e. do the pipes interconnect to all the tanks or only to those tanks with which it is shown to be connected. Provide color coding for incompatible waste group piping systems for ease of review. Elaborate on whether or not the piping systems are dedicated.

b. Explain the following:

i) Line 1 is stated to run from Tank 5 only but it also connects Tanks 1 and 3.

ii) Line 3 is shown as connecting to Tank 13 also.

iii) Line 4 is listed as running to Tank 21 but is shown as connecting to Tank 19.

iv) Line 5 is listed as connecting to Tank 8 but there is no direction listed for the flow.

v) The significance of Line 8. What compatibility groups can be pumped through the spare line? How is it assured that the line is decontaminated between use? Elaborate on any controls associated with this line.

c. Elaborate on whether or not Willow Street and Building E are considered to be part of the NPDES permit and consequently the wastewater treatment system.

4. Map 7

Update the construction schedule to show what has been completed according to schedule and what is incomplete at this point in time.

E. Procedures to Prevent Hazards

Security Procedures and Equipment [264.14, 270.14(b)(4)

1. Explain security measures in regards to the CWTP, i.e. - is a guard present or is the area accessible to all P&W employees. Elaborate on all procedures, personnel, and equipment to be used as a means to control entry.

2. Provide the location and a description of the surveillance equipment used in the CWTP with respect to each of the three RCRA storage areas.

3. Provide the height and the materials of construction for all fencing in the area.

4. Verify that each type of sign used has wording in all predominant languages and is legible from a distance of at least 25 feet. Provide all applicable signs for the Southeastern curve of fencing on both sides of the water tank.

Inspections

1. Elaborate on what is meant by "...non-emergency maintenance ... will be completed as soon as possible." Provide an example of this type of situation, the remedy, and the amount of time necessary to provide said remedy.

2. Explain what equipment the preventative maintenance systems entails and at what frequency the inspections are done. Provide a copy of the cards that are issued.

3. Update all inspection logs to include the proposed WSF and provide a separate appendix for those logs which are no longer applicable to this permit.

4. Provide the actual inspection logs for each container and tank storage area. The inspection logs should each contain, at a minimum, the following information:

- Container storage area being inspected - Acids, Bases, Cyanides, etc.

- Tank storage area and ancillary equipment - tank number, type of waste stored there.

- Tank (internally and externally)

- Monitoring equipment

- Operating and structural equipment

- Safety and emergency equipment

- Security devices

Each inspection schedule log should provide the specific item being inspected, separate spacing for the types of problem being inspected, the frequency of inspections, the status of each item relative to each type of problem (acceptable/unacceptable), the necessary space to record any observations, and the date and nature of the repairs/remedial action taken. In addition, the quantity of each item being inspected should be supplied as appropriate.

5. Verify by separate inspection logs that each container and tank storage area is inspected.

6. Verify the procedures and the frequency for inspections of tank interiors.

7. Provide the frequency of fence inspections. Clarify the immediate action taken to repair any tampering or gaps found.

8. Verify that containers will not be left in the staging area for a period of greater than 24 hours.

9. Explain the meaning of the "P&W Loss Prevention Standard".

10. Provide the necessary information to assure that all inspections as required by NFPA are performed.

<u>Equipment Requirements [264.32]</u>

1. Provide any special procedures followed at times when only one person is in the CWTP.

2. Assure that all internal and external communication systems are accessible to all employees in the CWTP and provide their locations.

3. Elaborate on what regulated buildings have sprinkle systems for fire protection and the nearest hydrant/hose house to each of the regulated buildings. Assure that there is an adequate volume and pressure to supply the necessary water hose streams.

4. Provide the width of the aisle space necessary for inspection and for placement of spill control equipment.

Preventative Procedures, Structures, and Equipment [270.14(b)(8)]

1. Explain any procedures used in handling wastes in loading areas that have floor drains and where the drains lead.

2. Update Preventative Procedures, Structures, and Equipment Section to include the proposed WSF and eliminate/separate out any areas that are non-regulated.

3. Elaborate on how drums and transporters are specially handled to prevent spills.

4. Specify how runoff is prevented in existing and new buildings.

5. Provide information on the prevention of water contamination and the mitigation of the effects of power failure in the proposed WSF, e.g. - if the pumps are automatic explain how they would be affected and how this effect would be remedied.

Precautions to Prevent Ignition or Reaction of Ignitable or Reactive Wastes [270.14(b)(7), 264.50 - 264.56]

1. Verify the location of all existing and future "No Smoking" signs depicted for CWTP-5, CWTP-6, and the proposed WSF. These locations should also be included in this section.

2. Elaborate on whether or not the drums used for hazardous wastes are completely new or if they are decontaminated. Explain all procedures used in handling and reuse of drums that previously contained hazardous wastes or hazardous wastes constituents.

F. Contingency Plan

General Information [264.52, 264.53, 265.37]

P&W should propose a modified organizational structure for this section. The DEP requires the Contingency Plan to include a detailed, independent, workable, instructional manual or document which will be utilized by both facility and/or non-facility (if necessary) emergency response teams responding to an emergency situation. In this regard, the Contingency Plan should simply but specifically identify the proper procedures to be taken to control any type or class of emergency response. P&W is requested to review guidelines such as the Emergency Response Guidebooks published by the U.S. Department of Transportation/Research and Special Programs Administration.

The Contingency Plan must identify:

A. The method by which a hazardous waste release would be immediately identified (by both facility and non-facility emergency response personnel);

B. The method by which personnel would determine the potential hazards from the released waste materials (possibly identified by a reference guide);

C. The emergency response actions which must be taken to control and correct the situation;

D. The specific identification of the proper equipment to be utilized by the emergency response personnel in performing their duties and;

E. The appropriate establishment of a communication network to control and eliminate the degree of hazards presented by the emergency situation.

The DEP recommends the utilization of: the National Fire Prevention Association's (NFPA) hazard classes (see NFPA-704), the standards and procedures required by NFPA-30, and the EPA document A Method for Determining the Compatibility of Hazardous Waste, as extremely useful methods for the classification of hazards in a uniform manner that is readily identifiable by various emergency response associations.

This Contingency Plan must demonstrate that P&W has properly evaluated their practices in regards to: the proper management of hazardous waste; P&W's ability to distinguish, and to assist off-site emergency personnel distinguish, various emergency situations; and for P&W (and/or additional counterparts) to properly respond to either an insignificant or a significant emergency situation.

1. Update application to include all applicable regulations for the State of Connecticut.

2. Distinguish between P&W's Fire Brigade and the East Hartford Fire Department. Also provide clear distinctions for each of the other response groups.

3. Verify the meaning of "hazardous substances" and whether it is pertinent to materials or wastes.

4. Elaborate on the Willgoos laboratory and facility. What are they and where are they located.

5. Verify that the underground storage tanks located at the Main Street facility are not used for greater than 90 day storage of hazardous waste.

6. Elaborate on the removal of drums to allow access to any leaking drums, i.e. - where are they put once removed from the section.

Emergency Coordinator [264.52(d), 264.55]

1. The Contingency Plan must be reviewed and immediately amended when any information associated with the Emergency Coordinator or his designated alternates changes, e.g. - name, phone number, address.

2. Verify that there is a distinct primary and alternate Emergency Coordinator for the third shift since R. Keene is listed in both positions.

Emergency Response Procedures

Notification [264.56(a)]

1. Verify that there is immediate access to telephones or the PA system in the any area where a spill can occur.

2. Elaborate on the methodologies for notification of state and local officials.

3. Clarify the correct address for CT DEP Oil and Chemical Spills and explain why they are listed under two names for notification (Oil and Chemical Spills and Connecticut Emergency Response Commission). The two numbers listed are for the exact same division.

4. The Part B application should state that whenever there is an imminent or actual emergency situation, the Emergency Coordinator or his designee must immediately activate internal facility alarms or communications systems to notify all facility personnel.

5. Provide information and procedures for notifying neighboring properties in an emergency. A list of contacts for all properties located within 1,000 feet of the facility boundaries must be included, provided no arrangements are agreed to with the local authorities regarding evacuation of these areas. If arrangements with the local authorities are made regarding evacuation of these neighboring properties all the specifics of the arrangements must be included.

Identification of Hazardous Materials [264.56(b)]

1. Clarify whether or not the incompatible waste groupings will be readily available to quickly assess compatibilities or will the markings automatically indicate this information.

2. Explain any and all procedures used to identify the material, its hazardous characteristics, and to assess the hazardous to human health and the environment.

3. Provide specific lists for each container and tank storage area of the Extremely Hazardous Substances (EHS) found in that area and their reportable spill quantities.

4. The Contingency Plan must include procedures to identify the hazardous waste and hazardous materials involved in an incident. The hazardous waste should be identified by waste streams for both on- and off-site wastes. Detailed procedures should be presented for materials identification in cases where waste documentation can not be provided to determine necessary identification.

Hazard Assessment [264.56(c) and (d)] .

1. Elaborate on the procedures for assessing the possible hazards to human health and the environment and the procedures for determining the need for evacuation of an area and the subsequent notification to the authorities.

2. Elaborate on why there is no mention of any type of personal safety equipment being worn throughout the Contingency Plan. Verify what types of personal safety equipment will be worn and how this will be decided.

Storage and Treatment of Released Materials [264.56(f) and (g)]

Describe all procedures used to determine whether the spill material residue will be treated or stored.

Post Emergency Equipment Maintenance [264.56(h)(2), 264.56(i)]

Elaborate on all procedures used to assure that all emergency equipment is cleaned and fit before any operations are resumed in the contaminated area.

Spills and Leakage [264.171, 264.194(c)]

1. Provide all procedures for removal of spill waste and repair or replacement of tanks or containers. Elaborate on any special procedures used for controlling leaks from storage tanks.

2. The application mentions that storm drains and manholes will be covered if there is spill of paints or solvents. Explain why storm drains and manholes are not covered during other spills.

Emergency Equipment [264.52(e)]

1. Provide quantities for all spill control, fire control, personnel protection and all other emergency equipment. In addition, provide the locations of all emergency equipment in the proposed WSF.

2. Explain why barrels is listed twice under the spill control equipment. Also explain why respirators and showers were eliminated from the personal safety equipment in several confined areas.

Coordination Agreements

Pratt and Whitney should provide copies of all letters to all agencies listed in the Coordination Agreements section. In addition, P&W should summarize the text of these agreements and provide a brief summary of the area within the site with which the various agencies are familiar.

Evacuation Plan [264.56(f)]

1. Provide the rationale for the primary and secondary evacuation routes, as well as the signal to initiate evacuation procedures.

2. Elaborate on why the evacuation route to Willow Brook Road is not the primary route.

3. Verify that there is not capability for a better evacuation route from the west side of the proposed WSF. In addition, verify that all evacuation routes have been posted in each of the container and tank storage areas.

4. Provide information on how it is assured that each area is in fact evacuated.

Required Reports [264.56(u)]

Discuss the provisions for submission of reports of emergency incidents within 15 days of the occurrence and the maintenance of records identifying the time, date, and details of any emergency incident.

G. Personnel Training

The outline of the training program for each of the CWTP and emergency response job positions at your facility must be submitted with your Part B application. It should list the topics of concern covered in both the initial training program and in the annual review program. The training outline should incorporate all the training elements necessary to comply with RCRA requirements.

The purpose of this outline is to prove that the program will prepare your "facility personnel" (as defined in 40 CFR 264.10) to operate and maintain the hazardous waste facility in a safe manner (as required by 40 CFR 264.16).

Job Titles and Duties [264.16(d)(1) and (2)]

1. P&W should provide the names of persons filling the job titles and descriptions submitted. P&W should clarify if the descriptions submitted cover all hazardous waste management positions for the CWTP. In addition, provide all job title descriptions and names for any emergency personnel who may respond to the Contingency Plan, e.g. - fire department, medical personnel, etc.

2. Demonstrate that the person/contractor responsible for actually training the employees has all the necessary and appropriate credentials.

Relevance of Training to Job Positions [264.16(a)(2)]

P&W must submit documentation that all facility personnel are instructed in hazardous waste management procedures (including contingency plan implementation) relevant to their position. Include a brief description on how training will be designed to meet actual job tasks.

Training for Emergency Response [264.16(a)(3)

Demonstrate that facility personnel are able to respond effectively to emergencies and are familiar with the following:

- emergency procedures, equipment, and systems
- automatic waste feed cut-off systems
- shutdown of operations
- communications and alarm systems

Implementation of Training Program [264.16(b) and (d)(4)]

Assure that any employee who is transferred to a new facility is retrained at that facility within six months of their start date.

H. Closure Plan and Financial Requirements

Closure Performance Standard [264.111]

1. Explain why the NPDES permit is not used in determining the clean standard parameters list. Verify if Appendix IX testing is done for each container and tank storage area. Provide a copy of the clean standard parameters list for each container and tank storage area.

2. P&W should include inhalation on the lists of pathways addressed for the clean standard parameters list.

3. Provide a detailed explanation of the Health and Safety Plan and explain the meaning of the term "unit" as used in the Closure Plan.

4. Provide the grid intervals and number of samples needed for each container storage area in the proposed Waste Storage Facility, CWTP-5, and CWTP-6; since more than one compatibility group is capable of being stored there.

5. Table H-3 provides sampling scenarios for 4 transporter pads whereas Figure H-3 depicts 5 transporter pads. Explain this discrepancy.

6. Provide random systematic sampling scenarios for each container and tank storage area, truck pad, unloading pad, and transporter pad. Verify that all areas of possible high level of contamination will be sampled in addition to the random systematic samples.

7. The Closure Plan should include an integrity assessment which would locate any cracks, gaps, or other surface damage which might have allowed migration of wastes to subgrade. If such surface damage is found, it should be investigated to determine if it penetrates entirely through the surface; if it does, samples should be taken to determine whether or not waste constituents have migrated through the surface. A provision should be included in this application stating that this type of situation would be handled by submitting a modified closure plan which details specific clean up measures to be taken if subgrade contamination is identified.

Partial and Final Closure [264.112(b)]

Verify if there is partial closure potential for any unit and the approximate time such partial closure could be implemented.

Maximum Waste Inventory [264.112(b)(3)]

Explain how the inventory at closure could exceed the maximum amount listed in Table H-1. Since the maximum container storage capacity exceeds the present amount listed on the Part A application, provide a breakdown of the inventory by building and compatibility groups and explain this discrepancy.

Inventory Removal, Disposal, or Decontamination of Equipment [264.114, 264.112(b)(4)]

1. Provide a detailed explanation of each step of decontamination for the storage areas, the tanks and the decontamination equipment. Explain the procedures to be followed if decontamination of any area is not achievable.

2. Sweepings, residues, rinsewaters, excavation debris and discarded personal protective gear from the decontamination of the storage areas should be disposed of as hazardous waste unless verified to be non hazardous.

Closure of Container and Tank Storage Areas [264.178, 264.179(a)]

1. P&W should provide a description of how all hazardous waste residues will be removed from tanks, pipings, and discharge control equipment at the time of closure.

2. The Closure Plan should specify whether the structures, piping, etc. in each tank storage area will be left in place or removed. P&W should provide procedures and a verification process for ensuring that the tanks and all their components have been decontaminated. In addition, provide clean standard parameters lists for each of the tanks/tank compatibility groupings.

3. After the decontamination procedures specified in the Part B application have been completed, random systematically selected concrete chip samples will be collected from each **individual, incompatible** containment area on the basis of one discrete chip sample collected and analyzed for each 10 foot by 10 foot area within the footprint of the waste storage group. For each non-porous surface, wipe test samples will be taken. These samples must cover an area of 0.50 square meters per sample for non-metals and 0.25 square meters

per sample for metals. In addition samples must be taken from areas of highest suspected contamination and random locations amounting to a minimum of at least three (3) samples per containment area/storage tank.

Closure Cost Estimate

1. Pratt and Whitney should provide a break down of the closure costs by building, including but not limited to the following:

- activity
- subactivity
- cost per hour(sample)
- number of hours(samples)
- what Health and Safety costs entail
- costs associated with dismantling equipment

2. Clarify what the 7% cost for insurance entails. Update all closure cost estimates, the contingency costs for tanks to 15 % from 10 %, and financial documentation to 1990.

RESOURCE CONSERVATION AND RECOVERY ACT
PART B PERMIT APPLICATION
UNITED TECHNOLOGIES CORPORATION
PRATT & WHITNEY
400 MAIN STREET
EAST HARTFORD, CT
CTD 990672081

TABLE OF CONTENTS

VOLUME II

TABLE OF CONTENTS

TABLE OF CONTENTS

SECTION D - PROCESS INFORMATION

1. Purpose

The purpose of this section is to present the specific process information required for waste management in the existing facilities. In addition this section presents conceptual design information and proposed operational procedures for planned modifications. Improved facilities for storage of hazardous wastes are currently in the early stages of planning and development. These facilities will replace the existing system for handling, transfer and storage of hazardous wastes in containers as well as in tanks.

A site plan showing the location of the existing hazardous waste management facilities is presented in Appendix D-1. The existing facilities are part of the Concentrated Waste Treatment Plant (CWTP). Operations involving hazardous wastes are conducted at six of the structures/components of the CWTP. Each such component of the CWTP has an identifying number (e.g. CWTP-2) for ease of reference in this application. When first described, the commonly used name is also given. Appendix D-2 shows floor plans of the pertinent facilities at the CWTP.

2. General Description of Facilities

a. Existing Facilities

The existing hazardous waste management facilities at the Pratt & Whitney East Hartford Plant are located at the CWTP. The six facilities are briefly described in this subsection as an overview. References to "containers" in this Section are meant to include all types of containers including drums, barrels and transporters as discussed subsection 11a in Section D.:

CWTP-1 (Control and Treatment Building)

This is a building which serves as the control center for hazardous waste handling operations and the following:

- Treatment tanks and associated pumps, piping and appurtenances for carrying out neutralization and chromium reduction reactions on concentrated wastes, some of which are hazardous wastes (these facilities are described herein to provide complete information on hazardous waste handling, but a permit for hazardous waste treatment is not being sought because the facilities are covered by an NPDES permit and are, therefore, exempt from RCRA permitting.
- A storage pad for storage of containers, located at the south end of the building.
- Three unloading stations for pumping out containers for transfer to storage tanks located adjacent to the east side of the building.

CWTP - 2 (Barrel Building)

- This is a building for storage of containers; it also has eight above ground storage tanks and associated facilities for tank truck loading/unloading and for emptying of containers into storage tanks (these facilities are located in or adjacent to the building).

CWTP - 3 (Waste Oil Tanks)

- This consists of three buried storage tanks.

CWTP-4 (Transporter Storage Pad).

- This is a containment area with a roof-over for storage of containers.

CWTP-5 (Storage Building A)

- This is a building for cleaning of various materials; for weighing and marking of containers; for storage of new chemicals; for storage of hazardous wastes in containers; for repair of equipment or containers; for storage of new containers; for lab pack preparation; and for PCB storage.

CWTP-6 (Storage Building B)

- This is a building for storage of containers.

b. Construction Drawings

Applicable construction drawings for the existing facilities are being submitted with this application as a separately bound roll of drawings for CWTP-1 through CWTP-6. These drawings are arranged in the following order:

-For CWTP-1 (Storage Pad at South End of Building):

Dwg. No. PE-MC-945-E Waste Treatment Building

Sheet 1 - Foundation Plan, Floor Plan, Operating Floor Plan, Anchor Bolt Layout (12-21-81 Rev. 10-8-82)

Sheet 2 - Anchor Bolt Layout, Demolition Plan, Details (12-21-81 Rev. 10-6-82).

Sheet 5 - Plan, Section, Elevations (11-9-81)

-For CWTP-1 and CWTP-3 (Buried tanks and ancillary equipment):

Dwg. No. PE-M-5460-E South Tank Farm Underground Tank Purchase (2-4-88)

Sheet 1 - Tank & Nozzle Design

Sheet 2 - Accessory Details

Dwg. No. PE-M-5468-E (Removal/Replacement of Underground Tanks):

Sheet 5 - Group E - East Hartford, Removal of Tanks 194 & 195, Replaced with 3 Tanks (6-17-88).

Sheet 6 - Group E - East Hartford, Replacement Details and specifications CWTP Tanks (6-17-88).

Sheet 7 - Group E - CWTP Waste Oil Tanks, Fill and Withdrawal Systens, Plans and Details.

Sheet 8 - Group E - CWTP Waste Oil Tanks, Fill and Withdrawal Systems, Details.

-For CWTP-2 (Barrel Building, Transporter unloading stations, Truck Pads)

Dwg. No. PE-MC-682-E (Conceptual Layout of Barrel Storage., Standard Steel Building.

Sheet 3 - Floor Plan, Elevations (6-6-80) Rev. 9-22-80).

Dwg. No. PE-MC-730-E (Material Storage and Transfer Bldg.)

Sheet 1 - Foundation Plan, Details (7-22-80, Rev. 9-25-80).

Sheet 3 - Floor Plan, Details (7-22-80 Rev. 9-25-80).

Sheet 4 - Foundation Plan, Details, Plumbing (11-20-80).

Dwg. No. PE-MC-762-E (Truck Loading & Unloading Pads - Sheet 1 (9-26-80 Rev. 11-24-80)

Dwg. No. PE-A-4090-E (Concentrated Waste Treatment Plant Modifications - Storage and Handling Bldg. (6-28-85).

Sheet B-1 - Floor Plan

Sheet B-2 - Receiving Station Part Plans

Sheet B-3 - Receiving Station Elevations

Sheet B-4 - Misc. Details

Sheet ME-1 - Mechanical & Electrical Floor Plan

For CWTP-4 (Transporter Storage Pad, Previously a Propane Shed)

Sheet 1 - Floor Plan and Foundation Plan, Sections & Details, Rework of Stl. Shed, General Notes (3-13-81 Rev. 6-9-81).

For CWTP-5 (Storage Building A)

Pre-Designed Structures Inc., United Technologies - 40.

Sheet A-1 - Plan & Elevations (6-7-89 Rev. 10-26-89).

Sheet A-2 - Wall Sections (9-28-89 Rev. 10-26-89).

Sheet F-1 - Foundation Plan, Sections and Details (6-7-89 Rev. 9-28-89).

For CWTP-6 (Storage Building B)

Pre-Designed Structures Inc., United Technologies - 20

Sheet A-1 - Plan, Elevations & Wall Sections (10-1-89).

Sheet F-1 - Foundation Plan, Section & Details (10-1-89).

c. Other Construction Information

Appendix D-3 presents available information on protective coatings applied to various surfaces in the existing facilities. Appendix D-4 presents specifications on the underground tanks at CWTP-3.

d. Planned Facilities

A planned hazardous waste handling facility will be constructed in the immediate vicinity of the existing CWTP. It will consolidate all hazardous waste storage facilities into one building, including storage in containers and in tanks.

3. Traffic

a. Existing Site

The site plan in Appendix D-1 shows traffic patterns at the existing CWTP. Typically tanker trucks and box trailers making deliveries of waste from other United Technologies plants enter the site through the gate west of the facility for access to CWTP-2. Vendors accepting waste from the facility also use this gate, as well as the road south of CWTP-2 to Willow Street and out through guard post 8 east of the Maintenance Building. All transporters (and at times other types of containers) from other United Technologies plants are unloaded from box trailers in the yard east of CWTP-1 with the trucks typically entering from the roads south of CWTP-2 or east of CWTP-1. Transporters are unloaded from trailers with fork lift trucks which move the transporters to the unloading stations at CWTP-1 or CWTP-2. Depending on waste inventory or the amount of traffic, transporters may be placed in CWTP-1, CWTP-4, CWTP-5 or CWTP-6 for temporary storage before being moved to unloading stations.

Wastes from the East Hartford plant are typically received in containers using fork lift trucks entering the site via the road south of CWTP-2 or east of CWTP-1. Barrels are typically delivered directly to CWTP-2 although if necessary, the containers are placed in storage on the pad at CWTP-1. Transporters are either taken directly to the unloading stations at CWTP-1 or CWTP-2 or placed in temporary storage at CWTP-1, CWTP-4, CWTP-5 or CWTP-6.

b. Improvements

Traffic patterns will improve upon completion of the planned facilities because access for large vehicles will be easier. The gate on the west side of the site will either be phased out, or depending on the actual site selected, may be used at times as an alternative truck access when other truck pads in the planned facility are occupied or otherwise inaccessible.

Deliveries of wastes from the East Hartford plant and other United Technologies plants will be at the truck pads or fork lift entrances at the planned facilities. These facilities will be totally weather-protected with containment, and will eliminate the need for the loading/unloading operations now being done in the yard east of CWTP-1. Likewise shipments of wastes out of the facilities will be loaded at the protected truck pads in the planned facility. All large vehicles moving hazardous wastes will normally use the wider on-site roads such as Willow Brook Road and Willow Street.

Fork lift trucks will continue to be used to move containers between the factory buildings and the planned facility.

4. Drainage

a. Existing Site

All facilities are designed to prevent run-on. In all cases grades around buildings and structures are sloped away from the facility. Building foundations are extended above grade. Roof drainage from all structures discharge to the ground surface near the structures, except for CWTP-5 and CWTP-6 from which roof drainage is piped directly into a catch basin connected to the storm drainage system. Catch basins are located east of CWTP-1, south of CWTP-2 and northwest of CWTP-3. These are all connected to various storm drain systems discharging into Willow Brook north of the site. The existing storm drainage system is shown on the site plan in Appendix D-1.

b. Improvements

There will be no major changes in drainage at the site upon completion of the planned facilities. The design of the planned facilities will prevent run-on and roof drainage from the building will discharge into the storm drainage system rather than on the ground surface. The planned construction will require that storm drainage in the area be modified. Regardless of the final site selection, it is expected that site runoff will continue to drain to Willow Brook.

5. CWTP-1 Facilities

CWTP-1 is a building which serves as the control center for all operations at the CWTP. These operations include hazardous waste operations under the RCRA Part A application as well as some hazardous waste operations exempted from RCRA permitting and some involving non-hazardous wastes. A floor plan of key features in this facility (as well as other facilities at the CWTP) is shown in Appendix D-2.

CWTP-1 was originally constructed about 1950 and numerous additions and modifications have been made since that time. The attached roll of drawings shows the contruction details of the hazardous waste handling parts of this building.

The facilities at CWTP-1 requiring a RCRA permit include:

- The three container unloading stations on the east side of the building and the pumps and piping from these stations to CWTP-3.

The container storage pad on the south side of the building.

The container unloading stations on the east side of CWTP-1 are designated as follows:

Unloading Station No.	Type of Waste	Pumped To
1	Hi-Flash Oil	CWTP-3 Tank U
2	B-2 & B-3 Oil	CWTP-3 Tank T
3	B-1 Oil	CWTP-3 Tank S

Each of the three unloading stations is arranged for placement of containers over a concrete containment during unloading. Each containment is 4 ft.-8 inches x 4 ft.-8 inches in plan with a depth of 6-1/2 inches. The volume of each containment is 88 gallons, calculated as follows:

$$4.67 \times 4.67 \times 0.54 \times 7.48 = 88 \text{ gallons.}$$

The containments have a roof-over which extends beyond the containments. The containments are above grade to prevent run-on.

Each containment is covered with grating on which the containers are placed. The containments are coated with Stonehard Co., Stonecrest GS-3.

For each station a steel wand and hose are provided for container unloading. The hose connects to a suction pipe leading to a pump in the basement. The pump discharge is piped to the fill line of one of the three storage tanks at CWTP-3. All piping is above ground steel and lines subject to freezing damage are heat traced with steam.

For each station an electrical control is provided to start and stop the pump used for unloading the containers.

The container storage pad on the south side of CWTP-1 is a concrete slab for storage of containers (normally barrels or transporters). The slab is pitched two inches from the perimeter toward a sump covered with grating. The pad is 18 ft. - 5-1/2 in. x 25 ft.-3 in. The sump was constructed with waterstops and is 16 ft. x 2 ft. in plan and has an average depth of 31 inches. The volume of the containment is 816 gallons, calculated as follows:

Sump: (16 x 2 x 2.58) x 7.48 = 618 gallons

Sloped Pad: 1/3 x 18.47 x 25.25 x 0.17 x 7.48 = 198 gallons.

Total containment volume = 618 +198 = 816 gallons.

The containment has a roof-over and the abutting pavement is sloped away from the pad to prevent run-on.

The other facilities at CWTP-1 do not require a RCRA permit because they qualify for an exemption under 40 CFR 264.1(g)(6) (covered by an NPDES permit) or are not involved in handling of hazardous wastes.

The NPDES exemption applies to facilities such as:

- Treatment tanks (4) for neutralization and/or reduction of hexavalent chromium to trivalent using chemical treatment.
- Treatment tanks (2) for oil-water separation using physical-chemical methods.
- Waste piping, pumps and appurtenances related to these treatment tanks within CWTP-1 and between the treatment tanks and the factory building.
- Piping, pumps and appurtenances between the waste oil treatment tanks and truck pad 3 at CWTP-2.

Other facilities at CWTP-1 include office and control room, laboratory, toilet, chemical feed systems for treatment tanks and miscellaneous storage, maintenance and support equipment.

6. CWTP-2 Facilities

This facility consists of a pre-engineered metal building, with a small basement and adjacent storage tanks in containments. In addition there are three truck pads in separate containments adjacent to the building. A floor plan is shown in Appendix D-2 and construction drawings are included in the attached roll of drawings.

The building for container storage has a concrete foundation having two walls which are common to the storage tank containments. The basement area in the northeast corner of the building is 14 ft. x 20 ft. x 7 ft.-4 in. high; it houses an alkali pump for unloading tank trucks and for transferring alkali wastes from the storage tank to a treatment tank. The basement also has a sump pump with discharge to the zyglo storage tank; a condensate pump (from steam tracing of piping) with discharge to the acid truck pad (Pad No. 1) inactive zyglo and solvent transfer pumps; steam supply; water flushing system; and a hot water heater.

The 10-inch floor slab in the basement was designed with waterstops in the concrete.

The main floor level of the building is 60 ft. x 60 ft. enclosed on three sides by a pre-engineered, uninsulated metal structure with a 20 ft. eave height. The south side is open and is about two feet above grade. The west side has a personnel door and a roll up door with dock leveler; it is four feet above grade where a paved truck access is available for loading/unloading of box trailers. The north side has a personnel door and abuts the acid storage containment and truck Pad No. 1. The east side abuts the containments for the remaining storage tanks.

The main floor slab is an 8-inch reinforced concrete structural slab over the basement and slab-on-grade over the remainder of the building. An asphalt-impregnated expansion joint is provided where the slab meets the foundation wall, except at the southeast corner where a separate slab with an integral 6-inch x 6-inch curb is provided for containment of the alkali and cyanide transporter unloading stations.

The main floor of the building at CWTP-2 is devoted to the following:

- Five areas for storage of containers
- One area for unloading of cyanide and alkali transporters
- One area for loading/unloading of box trailers
- One area for pumping out barrels of zyglo and oils/solvents.

The main floor is pitched to five separate sumps for each of the container storage areas. Four of these (Nos. 1,2,3 and 4) are identical, each being 25 ft. x 14 ft.-3 inches in plan with a floor pitch of 1.5 inches (0.125 ft.) from high points to the sump which is 2 ft. x 2 ft. x 2 ft.-6 inches deep, providing a containment volume of 184 gallons, calculated as follows:

$$(1/3 \times 25 \times 14 \times 0.125 + 2 \times 2 \times 2.5) \times 7.48 = 184 \text{ gallons}$$

for each of the four containments (Nos. 1,2,3 and 4).

Area No. 5 for container storage is 50 ft. x 18 ft.-5 inches in plan with a floor pitch of 3 inches (0.25 ft.) from high points to the sump which is 2 ft. x 2 ft. x 2 ft.-6 inches deep, providing a gross containment volume of 628 gallons, calculated as follows:

(1/3 x 50 x 18.42 x 0.25 + 2 x 2 x 2.5) x 7.48 = 649 gals.

A small corner of this area (12 ft. x 8 ft.-6 inches) with a floor pitch of one inch (0.083 ft.) is occupied by the alkali/cyanide transporter unloading stations. The volume of this section is 21 gallons, calculated as follows:

1/3 x 12 x 8.5 x 0.083 x 7.48 = 21 gals.

The net containment volume for Area No. 5 for container storage is 628 gallons, calculated as follows:

649-21 = 628 gals.

The area for unloading of alkali/cyanide transporters is separately curbed from the remainder of the building. The curbed area has a floor drain piped into the alkali/cyanide storage tank containment.

Each of the five sumps on the main floor are a continuous concrete pour and have a corrosion-resistant coating (Ceilcote Flakeline 600).

There are eight storage tanks located at CWTP-2. A list of the tanks is shown in Table D-1 which includes information on tank capacity (full and with one foot of freeboard). Information on tank construction is shown in Table D-2 and Appendix D-3.

TABLE D-1
STORAGE TANKS AT CWTP-2

TANK NO.	MATERIAL STORED	TANK HEIGHT	TANK DIAMETER	TANK CAPACITY (GALS) FULL	1' FREBRD.	NOMINAL SHELL THICKNESS	ACTUAL SHELL THICKNESS
1	Acid	7-4"	10'	4300	3720	1/4"	
2	Acid	7'	7'	2010	1730	1/4"	
3	Zyglo	7-'8"	10'-6"	4970	4320		
4	Solvent	7'	10'	4110	3520	1/4"	0.280"
5	Chromium	7'	10'	4110	3520	1/4"	0.280"
6	Alkali	7-3"	10'	4260	3670	1/4"	
7	Cyanide	6-9"	10'	3960	3380	1/4"	0.335"
8	Cyanide	8'10"	7'8"	3050	2360	1/2"	0.730"
Total					26560		

TABLE D-2

STORAGE TANK CONSTRUCTION AT CWTP-2

TANK NO.	WASTE STORED	TANK CONSTRUCTION MATERIAL	LINER	DATE CONSTRUCTED
1	Acid	Steel	3/16" Hypalon	1989
2	Acid	Steel	3/16" Hypalon	1989
3	Zyglo	Steel	None	1970's
4	Solvent	Steel	None	1970's
5	Chromium	Steel	3/16" Hypalon	1970's
6	Alkali	Steel	3/16" Hypalon	1989
7	Cyanide	Steel	None	1970's
8	Cyanide	Fiberglass	None	1970's

Five concrete containments are provided for the eight storage tanks. These containments have one wall common with the foundation wall of the adjacent building at CWTP-2. The containment walls and slabs are constructed with waterstops and are coated with a corrosion resistant coating believed to be Ceilcote Flakeline 600 (See Appendix D-3). The tank containments have a fiberglass roof-over with an overhang; the tops of the containment walls are above grade to prevent run-on.

The containments for storage tanks at CWTP-2 are as follows:

Mixed Acids Containment (2 tanks: 4300 gals. and 2010 gals.)

Containment Dimensions: 24 ft. x 11 ft. x 5 ft. high

Dimensions of smaller tank: 7 ft. diameter (12" off floor)

Total containment volume = 24 x 11 x 5 x 7.48 = 9870 gals.

Submerged volume of smaller tank = 3.14 x 3.5 x 3.5 x 4.0 x 7.48 = 1150 gals.

Net containment volume = 9870 -1150 = 8720

Zyglo & Oils/Solvents Containment

(2 tanks: 4970 gals & 4110 gals.)

Dimensions: 21 Ft. -9 ins. x 11 ft. x 5 ft. high

Total containment volume = 21.75 x 11 x 5 x 7.48 = 8950 gals.

Dimensions of smaller tank: 10 ft. dia. (12" off floor)

Submerged volume of smaller tank = 3.14 x 5 x 5 x 4.0 x 7.48 = 2350 gals.

Net containment volume = 8950 -2350 = 6600 gals.

Chromic Acid Containment (1 tank: 4110 gals.)

Dimensions: 12 ft.-3 ins. x 11 ft. x 5 ft. high

Containment volume = 12.25 x 11 x 5 x 7.48 = 5040 gals.

Alkali/Cyanide Containment (3 tanks:4260, 3960 & 3050 gals.)

Containment Dimensions: 34 ft.-8 inches x 11 ft. x 5 ft. high

Dimensions of smallest tank: 7'8" dia.; 14" off floor

Dimension of next to smallest tank:

10 ft. diameter; 16" off floor

Total containment volume = 34.67 x 11 x 5 x 7.48 = 14262 gals.

Submerged volume of smallest tank = 3.14 x 3.83 x 3.83 x 3.83 x 7.48 = 1320 gals.

Submerged volume of next to smallest tank = 3.14 x 5 x 5 x 3.67 x 7.48 = 2155 gals.

Net containment volume = 14262 - 1320 - 2155 = 10787 gals.

There are four existing transporter unloading stations for transfer of liquids by gravity into the storage tanks. These are for alkali and cyanide and are located in a common containment at the southeast corner of the building; for acids located adjacent to the north side of the acid tank containment; and for chrome wastes located adjacent to the east side of the chrome storage tank containment. Each station has a containment with a drain to the respective tank containments. Each station has an inclined stand on which the transporter is placed. A receiving sump with a screen is provided to receive the transporter contents which are dumped through the screen and into the sump, and are piped to the respective storage tank.

Active piping associated with CWTP-2 is shown schematically in Appendix D-5. Some of the piping is above ground and some is buried between CWTP-2 and CWTP-1. There are some lines which are not in use, including those undergoing closure between CWTP-2 and the wax building.

Buried piping on the CWTP site known or suspected to have carried hazardous wastes is listed in Table D-3 and is located on the site plan in Appendix D-6.

There are several pipe lines buried below the truck pads and main floor slab of the building. These run (1) between the truck pads and the basement and (2) between the storage tanks on the east side of the building and the basement. The only active lines are (1) the alkali pump suction line from the truck pads to the basement and (2) the alkali pump suction line from the storage tank to the basement.

There are three concrete pads at CWTP-2 for loading and unloading tanker trucks. The pads are typically used for the following functions (although some variations in these are at times used):

No. 1 - Acids, including chromic acid, unloading

No. 2 - Zyglo and alkali unloading

No. 3 - Oil loading and unloading

Piping for carrying out these functions is covered in Appendix D-5.

TABLE D-3

EXISTING BURIED PIPING
(Portions of some lines are in concrete trenches)

Number	Size (inches)	Material	Fluid	Status (Act = Active) (NIU = Not in use)	Location From	Location To
1	1 1/2	Steel	Blended Waste	NIU	Basement CWTP-2	Wax Bldg.
2	1	Steel	Soluble Oil	NIU	Basement CWTP-2	Wax Bldg.
3	1	Steel	Soluble Oil	NIU	Basement CWTP-2	Wax Bldg.
4	2	PVC	Blended	NIU	Basement CWTP-1	Wax Bldg.
5	2	PVC	Acid	NIU	Truck Pad 2	Basement CWTP-2
6	2	Steel	Zyglo, Alkali	NIU	Truck Pads 1 and 2	Basement CWTP-2
7	2	Steel	Cyanide	NIU	Truck Pad 1	Basement CWTP-2
8	2	Steel	Blend	NIU	Truck Pad 1	Basement CWTP-2
9	6	PVC	Containment Overflow	ACT	Truck Pad Containments	Buried Holding Tank
10	6		Containment Drains (Truck Pads 1 and 2)	ACT	Truck Pad Valve Pit	DWW Sump in CWTP-1

TABLE D-3 (Continued)
EXISTING BURIED PIPING (Continued)
(Portions of some lines are in concrete trenches)

Number	Size (inches)	Material	Fluid	Status (Act = Active) (NIU = Not in use)	Location From	Location To
11	6		Containment Drain (Truck Pad 3)	ACT	Truck Pad 3	Sump in CWTP-1
12	3	Steel	Alkali	ACT	Storage Tank	Basement CWTP-2
13	3	Steel	Cyanide	NIU	Storage Tank	Basement CWTP-2
14	3	PVC	Cyanide	NIU	Storage Tank	Basement CWTP-2
15	3	PVC	Cyanide	NIU	Storage Tank	Basement CWTP-2
16	2	FRP	Acids	ACT	Acid Containment	Treatment Tanks
17	2	FRP	Chromic Acid	ACT	Chromic Acid Containment	Treatment Tanks
18	2	PVC	Alkali	NIU	Basement CWPT-2	Treatment Tanks
19			Dilute Chrome	NIU	Truck Pad 3	Basement CWTP-1
20	2	PVC	Chromic Acid	NIU	Basement CWTP-2	Treatment Tanks
21	4	FRP	Cyanide and Alkali	ACT	Alkali/ cyanide unloading station	Alkali/ cyanide tank containment

Each truck pad has a separate containment system with a sloped parking position for the truck and a sump at the low end. The curbs are above grade and the pavement at the truck approach to the pads is sloped away to prevent run-on. A drain from the sump is piped to a valve pit for directing spills or precipitation to the DOW or DWW sumps in the basement of CWTP-1. Each sump also has a high level overflow piped to the containment holding tank east of the truck pads. Concrete was placed with waterstops, and sumps are coated with Ceilcote 600 (See Appendix D-3). Containment volume calculations for the truck pads are as follows:

Sump volume all pads = 9 x 3 x 2.67 x 7.48 = 539 gals.

Volume at entrance curb (pads 1 and 2) = 0.5 x 3.5 x 0.67 x 12.5 x 7.48 = 110 gallons.

Volume at entrance curb (Pad 3) = 0.5 x 3.5 x 0.67 x 11.0 x 7.48 = 97 gals.

Volume of sloped section (Pads 1 and 2) = $\frac{(0.67+1.00)}{2}$ x 12.5 x 36.5 x 7.48 = 2843 gallons.

Volume of sloped section (Pad 3) = $\frac{(0.67+1.00)}{2}$ x 11.0 x 36.5 x 7.48 = 2500 gals.

Volume above sump (Pads 1 and 2) = 3.5 x 1.0 x 12.5 x 7.48 = 327 gallons.

Volume above sump (Pad 3) = 3.5 x 1.0 x 11.0 x 7.48 = 288 gals.

Delete volume of pipe island (pad 1)
= $\frac{(11.0+13.5)}{2}$ x 2.25 x 0.67 x 7.48 = 138 gallons.

Delete volume of pipe island (pad 2)
= $\frac{(9.5+12.0)}{2}$ x 2.25 x 0.67 x 7.48 = 121 gallons

Containment - Truck Pad 1 = 539+110+2843+327-138 = 3681 gallons.
- Truck Pad 2 = 539+110+2843+327-121 = 3698 gallons.
- Truck Pad 3 = 539+97+2500+288 = 3424 gallons.

The containment holding tank is of precast concrete construction with a Ceilcote 600 coating (see Appendix D-3). It is 8 ft. x 14 ft. in plan and 7 feet deep. It has a volume of 5860 gallons calculated as follows:

8 x 14 x 7 x 7.48 = 5864 gallons.

7. CWTP-3 Facilities

The CWTP-3 facilities consist of three buried steel double wall tanks each with 10000-gallon capacity for storage of waste oils. The tanks are 10-ft. 6 inches in diameter and are 15 feet-6 inches long; they were installed in 1989. Data on these tanks is included in the attached roll of construction drawings and specifications are included in Appendix D-4; related piping is covered schematically in Appendix D-5. A plan of the facility is shown in Appendix D-2.

Each tank has the following features:

- Fill line
- Oil removal line
- Water removal line
- Level sensor
- Cathodic protection
- Access manhole
- Interstitial monitoring

All piping associated with the tanks is above ground steel piping with steam tracing to prevent freezing. This piping includes lines to the truck pads at CWTP-2 for removing oil and to the fill pumps in the basement of CWTP-1. Tank R has a line connected to a dewatering pump in the basement of CWTP-1; the other tanks have dewatering lines piped to the basement but they are not connected to a pump and are not in use.

8. CWTP-4 Facility

The CWTP-4 facility consists of a concrete pad with three separate curbed containments. A roof-over is provided; the curbs are above grade and the pavement at the truck approach to the pads is sloped away to prevent run-on. Information on the construction of this facility is presented in the attached roll of construction drawings. A plan of the facility is shown in Appendix D-2.

Three concrete containments are provided for storage of transporters or containers on pallets. Each containment is 15 feet from front to rear, and a pitch of 10 inches is provided down from the entrance. The widths of the three containments are 24 ft.- 6 inches, 14 ft.-2 inches and 19 ft.-6 inches. Each containment has a sump 12" x 12" x 9" deep. This provides containment volumes calculated as follows:

Each sump = 1 x 1 x 0.75 x 7.48 = 6 gallons
Cross-sectional area of each containment = 0.5 x 15 x 0.833 = 6.25 S.F.
Containment No. 1 = 6 + 6.25 x 24.5 x 7.48 = 1151 gals.
Containment No. 2 = 6 + 6.25 x 14.17 x 7.48 = 668 gals.
Containment No. 3 = 6 + 6.25 x 19.5 x 7.48 = 918 gals.

9. CWTP-5 Facility

The CWTP-5 facility consists of a pre-engineered, weather-tight, heated metal building with a concrete floor slab.

The building is used for storage of waste in containers and for several related activities such as weighing of containers, labeling of containers, cleaning of various materials and for repair of equipment or containers. A cleaning tank and containment pit are provided in the center bay of the structure. The floor of this bay and the two end bays are pitched from high points to three sumps formed of welded steel plates. The slab at the high points and at the perimeter curbs has a waterstop. The floor, sumps and curbs are coated with Ceilgard 630 (See Appendix D-3). The curbs are above grade and the pavement at the truck approach to the building is sloped away to prevent run-on. Data on construction of this facility is presented in the attached roll of construction drawings. A plan of the facility is shown in Appendix D-2.

The three bays of the building provide containment for storage of waste in containers. The containment volumes are calculated from the high point elevation of the floor to the sump; the high point of the floor is six inches below the entrance and the perimeter curb. Therefore, a separate calculation of containment volume is presented for the condition where all wastes stored in the building are compatible and containment would be available to the top of the curb rather than only to the high points in the floor.

The containment volume calculations are as follows for the three separate containments:

All sumps: 18" x 18" x 18" deep; Volume = 1.5 x 1.5 x 1.5 x 7.48 = 25 gals.

Size of area No. 1: 25'-4" x 43'-6" x 3" floor pitch to sump

Volume = (1/3 x 25.33 x 43.5 x 0.25 x 7.48) + 25 = 711 gals.

Size of area No. 2 (does not include pit): 32'-9" x 26'-8" x 3" floor pitch to sump

Volume = (1/3 x 32.75 x 26.67 x 0.25 x 7.48) + 25 = 569 gals.

Size of area No. 3: Same as No. 1 except delete area for scale room

Delete for scale room: 12' x 7'-6" x 1-1/4" pitch

Volume = 1/3 x 12 x 7.5 x 0.1 x 7.48 = 67 gals.

Net volume for Area No. 3 = 711 -67 = 644 gals.

The containment volume calculations are as follows for the entire curbed area considered as one containment:

At entrance floor pitches down 6 inches over a distance of 5 feet for a length of 66'-8"; this volume is:

1/2 x 5 x 0.5 x 66.67 x 7.48 = 623 gals.

The remainder of the floor provides a six-inch depth of containment in addition to that calculated above for each containment bay. The area is 43'-6" x (25'-4" + 26'-8" + 25'-4") less 7'-6" x 12' for the scale room; this volume is:

((0.5 x 43.5 x 77.33)-(7.5 x 12)) x 7.48 = 11910 gals.

The total containment is as follows (ignoring the soak tank and its containment pit):

711 + 569 + 644 + 623 + 11910 = 14460 gals.

10. CWTP-6 Facility

The CWTP-6 facility consists of a pre-engineered, weather-tight, heated metal building with a concrete floor slab. The building is used for storage of waste in containers. There are three separate concrete containments each with a curb and ramped entrance and a sump formed of welded steel plates. The floor, sumps and curbs are coated with Ceilgard 630 (See Appendix D-3). The curbs are above grade and the pavement at the truck approach to the building is sloped away to prevent run-on. Data on construction of this facility is presented in the attached roll of construction drawings. A plan of the facility is shown in Appendix D-2.

Three concrete containments are provided for storage of transporters or containers on pallets. Each containment is 22 ft-4 inches from front to rear and a pitch of six inches is provided down six feet from the entrance. The rear 16 feet-4 inches is level except for a three-inch pitch to a sump 18" x 18" x 18" deep. The widths of the three containments are 18 feet, 39 feet and 18 feet. This provides containment volumes as follows:

Each sump = 1.5 x 1.5 x 1.5 x 7.48 = 25 gals.

Containment Nos. 1 and 3:

((0.5 x 0.5 x 6 x 18) + (1/3 x 16.33 x 18 x 0.25) + (16.33 x 18 x 0.5)) x (7.48) + 25 = 1510 gals.

Containment No. 2:

((0.5 x 0.5 x 6 x 39) + (1/3 x 16.33 x 39 x 0.25) + (16.33 x 39 x 0.5)) x (7.48) + 25 = 3240 gals.

11. Container Storage

a. Types of Containers

Several types of containers are used for storage of hazardous wastes. All containers are DOT-approved and all are compatible with the wastes stored in them. The most commonly used containers are 55-gallon steel barrels, 20-gallon fiber drums, 375-gallon steel transporters and 200-gallon polyethylene transporters. Containers are lined as necessary for chemical resistance to the wastes stored in them. All drums and barrels used for storage of hazardous waste are new.

Fifty-five gallon drums are typically DOT 17C, 17E, or 17H or 6D.

The 375 gallon transporters are lined with materials compatible with their respective contents. It should be noted that these transporters comply with DOT Specification 60 except that the ends of the transporters are bolted rather than welded as prescribed by 49CFR 178.225-1(a). Because of this, an exemption from DOT hazardous materials regulatory requirements has been obtained.

Other sizes of containers are in use and new types of containers are being acquired in several different sizes and materials of constrauction to improve container management and to facilitate handling. All such containers will be DOT approved and will be compatible with the wastes placed in them.

b. Handling of Containers

Containers are typically moved by fork lift truck. Containers are generally strapped to pallets. Typical arrangements include four 55-gallon barrels on a 48-inch square pallet and six fiber drums on a pallet 2'-8" x 4'-0". Transporters are designed to be lifted directly by fork lift truck.

Pallets are six inches high to elevate containers off the floor of the containment. The tank portion of transporters is 6 to 12 inches above the base supports.

Containers from other United Technologies facilities are received by box trailer and are unloaded by fork lift truck. Vendors trucks are used to ship wastes off-site for treatment and disposal; these are also loaded by fork lift truck.

c. Types of Wastes

The types of wastes handled are described in Section C of this application. Containers are generally segregated in storage based on the following categories:

- Acids and chromes
- Alkalis and cyanides
- Oils/solvents
- Oxidizers

d. Marking and Labeling

CWTP personnel are responsible for supplying the appropriate waste containers to departments generating hazardous wastes. Before a container is supplied to a generating department, CWTP personnel place all stick-on labels required by state and federal regulations for waste accumulation, storage, and shipment on the container.

A new computerized waste tracking system is being planned. Labels will be generated by computer and a bar code identification system will be instituted to track all containers from time of delivery to final disposition of the wastes.

e. Distribution and Pickup of Containers

The generator makes a telephone request for one or more containers. The following information is obtained:

- Waste Type Generic Description (proper shipping name)
- Container Quantity
- Department
- Supervisor's Name and Phone Number
- Location (include column #)
- PMC/PS/PWA numbers (product or solution from which the waste was generated)

This information is used to determine the type and labeling of containers which are then delivered to the generator by CWTP personnel. When ready for pickup the generator informs CWTP personnel who pick up the containers.

f. Accumulation

Up to 55-gallons of hazardous waste or one quart of acutely hazardous waste are allowed to accumulate at or near the point of generation providing that the following requirements are met.

- the containers are in good condition
- the waste is compatible with the container
- the container remains closed except when waste is being added or removed

- the container is clearly marked with the words "Hazardous Waste" and the contents are clearly identified

- The dates accumulation began and container became full appear on the Hazardous or Non-hazardous waste labels attached to the container

In general, once these quantities of waste are exceeded, the containers are moved to the container storage area or to another regulated treatment, storage, or disposal area within 72 hours.

g. Containers With Free Liquids

Wastes with free liquids are generally transferred to the bulk storage tanks at CWTP-2 whenever possible so that they can be (1) treated at CWTP-1, or (2) sent to a vendor by tanker truck. Therefore, the number of containers in storage with free liquids is limited. Generally most of these wastes are delivered to the CWTP in transporters. Fiber drums are not used for waste with free liquids.

h. Use of Container Storage Areas

There are five container storage facilities available at the CWTP. These have been described in subsections D-5, D-6, D-8, D-9 and D-10. They include a total of 15 areas as follows:

- CWTP-1 pad at south end (one containment area)
- CWTP-2 main floor of building (three containment areas)
- CWTP-4 container storage pad (three containment areas)
- CWTP-5 three containment areas
- CWTP-6 three containment areas

Typically these 15 areas are used in the manner shown on the floor plans in Appendix D-2. These areas may be used with other arrangements of containers (See Appendix D-7). Also the 15 areas are not permanently designated to contain particular waste types. Instead, a system of securely fastened waste identification signs is used to ensure that at any given time, all wastes within a particular section are compatible.

When the waste type assignment for a particular storage compartment is changed, the compartment is first inspected for signs of contamination. If contamination is found, the compartment is decontaminated by scrubbing and washing using appropriate cleaning solutions to remove all visible residue. The wash water is pumped into appropriate containers for disposal.

Section E of this application covers related matters on incompatibles.

Wastes are stored in the container storage areas with their covers securely fastened, but additional wastes may occassionally be added to containers already placed in storage. However, liquid wastes are frequently removed from containers and transferred to bulk storage tanks.

A visual inspection of all containers of waste is made prior to acceptance at the facility to ensure the following:

(1) Wastes are in appropriate containers
(2) Waste containers are properly labeled
(3) Waste containers are not damaged or leaking
(4) Waste containers are tightly closed
(5) Waste containers are accompanied by internal manifests

Containers to be shipped off-site are generally stored in CWTP-2 while awaiting shipment. Other related operations conducted in this facility include, as necessary:

- Re-packaging of drums
- Pumping of liquids from containers into tanks
- Inspection of incoming containers
- Labeling
- De-heading of barrels
- Removing sludges from containers

The contents of the container storage facility are inspected on a weekly basis. A more detailed description of these weekly inspections is presented in Section F of this application.

i. Management of Containments

Containments are inspected in accordance with the inspection plan. Deficiencies noted on inspections are corrected. If liquids are found, a sample is obtained and tested for pH and other parameters as appropriate to that containment (e.g. cyanide in a cyanide containment). A portable pump and hoses are used to remove the liquid into a transporter for transfer into the appropriate bulk storage tank.

j. Container Storage Capacity

An analysis of the available storage capacity for containers is presented in Appendix D-7. This analysis presents the following for each of the 15 available containment areas:

- The maximum number of containers which can be physically fit into the area using the following criteria:
  - Stacking height = two high except one high for:
    - All transporters
    - All containers in CWTP-4
    - All containers on the steeper floor section at the entrances of CWTP-5 and CWTP-6
- The maximum number of 55-gallon barrels and transporters which can be placed when considering the available containment volume.

This analysis indicates, for example that the 15 containments can accomodate 1124 55-gallon barrels (total storage = 61820 gallons) with proper consideration of aisle space, fork lift truck maneuvering and available containment volume.

Normally somewhat less volume would be in storage because many containers have no free liquids. A typical arrangement for normal usage is shown in Appendix D-2.

12. Storage in Tanks

a. Capacity and Description of Tanks

The 10 tanks used for storage of hazardous wastes are described in subsections D-6 and D-7 with further details in Appendix D. There are eight above ground tanks at CWTP-2 and three buried tanks at CWTP-3. The tanks are compatible with the wastes stored in them. The type of wastes handled correspond to the names of the tanks as presented in subsections D-6 and D-7. The capacities of the tanks are shown in Table D-1.

All above ground tanks are placed in concrete containments having sufficient volume to contain the volume of the largest tank in the containment (see calculations in subsection D-6). The truck pad containments are augmented by use of a containment holding tank to provide sufficient volume to hold the contents of a single tanker truck (maximum 4500 gallons) plus precipitation from a 25-year 24-hour storm. The buried tanks are of double wall construction. The total storage volume available in tanks is 56560 gallons.

b. Feed Systems

Appendix D-5 shows schematics of the piping systems associated with each tank. The above ground tanks at CWTP-2 are typically filled as follows:

Gravity discharge from 375-gallon transporter:

Tank Nos. 1 & 2 (Acids)
Tank No. 5 (chrome)
Tank No. 6 (Alkali)
Tank Nos. 7 & 8 (Cyanide)

Pumped discharge from containers:
All tanks

Gravity discharge from tanker trucks:
Tank No. 6 (Alkali)

Pumped discharge from tanker trucks:
Tank Nos. 1 & 2 (acids)
Tank No. 5 (chrome)

The above ground tanks are in close proximity to the tanker truck pads and overfilling is prevented by checking the available volume in the tank vs. the amount to be transferred from the tanker truck or container. Transporters are placed on the inclined unloading station platform and the vent and drain valves are opened to empty the transporters, which is then flushed with water. Barrels are emptied with a wand and hose connected to a pump suction.

Tanker trucks are placed on the truck pad for materials compatible with the content of the tanker. Hose materials from the tanker to the facility are compatible with the waste; connections are made within the containment. Pumps transfer the tanker contents to the appropriate storage or treatment tank.

Materials are sampled and analyzed according to the waste analysis plan. All shipments are sampled, at a minimum, to visually verify that the material was as described.

Tankers are usually dedicated to specific wastes. In that case each tanker is not washed out. For tankers with variable wastes, tankers are rinsed with water and the rinsate is added to the appropriate storage tank.

The feed system for the two buried hazardous waste storage tanks involves pumping from containers through above ground piping to the tanks. On-off switches are provided at the container unloading stations. The pump automatically shuts off when the tank is 95 percent full using an auatomatic signal from a tank level sensor and monitoring system (MCG 1100 by L&J Engineering).

c. Tanker Truck Pickups and Delivery

Some materials are accepted at the CWTP in tankers on a daily basis. UTC vehicles do a "milk run" as scheduled at other UTC facilities and material is transferred in tankers and accepted at the CWTP without prior arrangements.

For most hazardous liquid wastes in bulk that are transferred to the CWTP, generation is on a random basis. For such loads, the generating facility calls the CWTP and indicates the State Manifest No. used, the P&W Internal Item I.D. NO. and the UN or NA No. This information is transferred to the UTC trucking unit responsible for hazardous waste interplant transportation.

Tanker trucks enter the CWTP through a secured gate off Willow Brook Road, or through the Guard Post 8 to the CWTP facility.

Tanker trucks are parked in the CWTP yard if they cannot be placed immediately on the loading pad.

d. Removal of Liquids from Tanks

Liquids stored in tanks are either pumped to treatment tanks in CWTP-1 or pumped out by a vendor. Pumps for the acid and chrome wastes are located within the respective containment and for alkali a pump is located in the basement of CWTP-2. The zyglo, solvent and cyanide tanks are pumped out using the vendors vacuum pumping system with a hose dropped into the tank.

e. Management of Containments

The containments at CWTP-2 are described and volumes calculated in subsection D-6. The truck pad containments have drain valves with buried drains leading to the appropriate sump in the basement of CWTP-1. However, during deliveries by tanker truck, the drain valve is closed to retain spills at the truck pad sump. When the sump is about half full (270 gallons ±) the overflow goes to the containment holding tank which holds up to 5800 gallons when full. Before the tank is full the levels in the tank and truck pad equalize and more than 9000 gallons of total containment is available (5864 + 3681 = 9545 gals). The design rain storm volume (truck pad No. 1) is (5.5 inches divided by 12) x 12.5 x 41.5 x 7.48 = 1780 gals. The maximum volume to be contained is 1780 + 4500 = 6280 gallons which is less than the containment volume of 9500 gallons.

Generally the truck pad containments are devoted to the following types of wastes:

No. 1 - Acids and chromes

No. 2 - Alkalis, solvents, zyglo

No. 3 - Oils

Containments are inspected in accordance with the inspection plan. Deficiencies noted on inspections are corrected. If liquids are found, a sample is obtained and tested for pH and other parameters as appropriate to that containment (e.g. cyanide in a cyanide containment). A portable pump and hoses are used to remove the liquid and transfer it into the appropriate bulk storage tank.

APPENDIX D

Designation	Title	Content
D-1	Concentrated Waste Treatment Plant-Site Plan	Topographic plan at 1"=40' w/1-foot contours shows drainage patterns to Willow Brook and traffic at the CWTP site

US EPA New England
RCRA Document Management System
Image Target Sheet

RDMS Document ID # 2561

Facility Name: PRATT & WHITNEY - MAIN STREET

Facility ID#: CTD990672081

Phase Classification: R-1B

Purpose of Target Sheet:

[X] Oversized (in Site File) [ ] Oversized (in Map Drawer)

[ ] Page(s) Missing (Please Specify Below)

[ ] Privileged [ ] Other (Provide Purpose Below)

Description of Oversized Material, if applicable:

APPENDIX D-1: SITE PLAN TRAFFIC AND DRAINAGE

[X] Map [ ] Photograph [ ] Other (Specify Below)

* Please Contact the EPA New England RCRA Records Center to View This Document *

APPENDIX D

Designation	Title	Content
D-2	Concentrated Waste Treatment Plant-Floor Plans	Floor plans of all facilities at 1/8"=1'-0" showing typical uses of the components

US EPA New England
RCRA Document Management System
Image Target Sheet

RDMS Document ID # 2561

Facility Name: PRATT & WHITNEY - MAIN STREET

Facility ID#: CTD990672081

Phase Classification: R-1B

Purpose of Target Sheet:

[X] Oversized (in Site File)   [ ] Oversized (in Map Drawer)

[ ] Page(s) Missing (Please Specify Below)

[ ] Privileged   [ ] Other (Provide Purpose Below)

Description of Oversized Material, if applicable:

APPENDIX D-2: FLOOR PLANS

[X] Map   [ ] Photograph   [ ] Other (Specify Below)

*** Please Contact the EPA New England RCRA Records Center to View This Document ***

APPENDIX D

Designation	Title	Content
D-3	Information on Linings and Coatings	1. Coatings for CWTP-2 2. Tank linings for CWTP-2 3. Coatings for CWTP-5 and CWTP-6

APPENDIX D-3
COATINGS FOR CWTP-2

The following pages present data on the coatings used at CWTP-2. Included are Ceilcote products:

Flakeline 600
Flakeprime 600

CEILCOTE

Reprinted January, 1983
Supersedes June, 1982

FLAKELINE® 600

TECHNICAL BULLETIN 601

- HIGH SOLIDS CATALYZED EPOXY
- SUPERIOR CHEMICAL RESISTANCE
- HIGH BUILD - 6 TO 8 MILS IN 1 COAT
- CURES DOWN TO 10°F.
- MEETS AIR EMISSION STANDARDS - "RULE 66"
- RECOAT UP TO 30 DAYS
- FLAKE REINFORCED - GREATER PERMEATION RESISTANCE

SELECTION DATA

GENERIC TYPE: Amine Adduct

GENERAL PROPERTIES: High build, flake filled epoxy topcoat providing improved chemical resistance to alkalis, inorganic acids and many aromatic and aliphatic solvents. Unique curing system allows application at temperatures well below freezing.

RECOMMENDED USES: For corrosion protection in chemical fumes, spillage or marine environments. Recommended for structural steel, piping, tanks or equipment in chemical, paper, marine and petroleum facilities. May also be used as a light duty lining in water or mild chemical solutions at ambient temperatures.

TEMPERATURE RESISTANCE: Dry heat resistance for temperatures up to 350°F. although color changes will occur at temperatures above 200°F.

Dry - 350°F.
Splash or Spillage - 160°F.
Immersion - 120°F.

GLOSS AND COLOR RETENTION: Semi-gloss finish. Surface may dull or yellow slightly with age, but chalk resistance and color retention is better than most epoxies.

ABRASION RESISTANCE: Excellent

SUBSTRATES: Apply over Flakeprime™, Polyzinc™ and 680 Primer/Saturant, recommended primers for steel or concrete, or other surfaces as recommended. May be used as a self-priming single coat system in mild to moderate corrosive atmospheres.

TOPCOAT REQUIRED: Normally not required. May be recoated with a second coat of Flakeline 600 or a catalyzed polyurethane.

SPECIFICATION DATA

TOTAL VOLUME SOLIDS: By Volume - 83% ± 2%
By Weight - 88% ± 2%

RECOMMENDED DRY FILM THICKNESS PER COAT: Chemical fumes or weathering normally require one coat at 6.0 dry mils. For direct spillage or immersion apply two coats at 6.0 to 8.0 mils per coat.

COVERAGE: Theoretical coverage is 1330 sq. ft. per gal. at 1.0 dry mils. Actual coverage (with 20% loss factor) should average 175 sq. ft. per gal. at 6.0 dry mils depending upon application conditions and film thickness. 8 wet mils will yield 6.5 dry mils.

SHELF LIFE: One year at temperatures below 90°F.

COLORS: Complete color range (see Ceilcote color chart). Other colors available on special order.

POT LIFE: 2 hours at 75°F.

FLASH POINT: (Pensky-Martens Closed Cup)
Component 'A' - 35°F. (2°C.)
Component 'B' - 210°F. (99°C.)
Mixed - 61°F. (16°C.)

PACKAGING: 1 and 5 gallons.

SHIPPING WEIGHT: 10.3 ± .2 lbs./gal.

APPLICATION: Airless, conventional, brush or roller.

140 SHELDON ROAD • BEREA, OHIO 44017 • PHONE 216-243-0700/TELEX: 825367/FAX 216-234-9414
P.O. BOX 40529 • (7100 WRIGHT ROAD) • HOUSTON, TEXAS 77240 • PHONE 713-466-6701

APPLICATION INSTRUCTIONS

SURFACE PREPARATION: Apply to clean, dry, properly primed surfaces. May be used as a self-priming coating.

APPLICATION EQUIPMENT: AIR SPRAY - Use Binks 18 or 62 spray gun; minimum 3/8" I.D. fluid line with #66 (.070) fluid tip and needle with 63PJ or #63PB air caps. For high production spraying substitute #67 (.086) fluid tip and needle with 67PD air cap. Adjust fluid pressure to provide adequate material to spray gun and use minimum atomization pressure to break up and flow out with minimum overspray.

AIRLESS SPRAY - Minimum 28:1 ratio pump with 60 mesh filter recommended. A Spraying Systems 25-A Gunjet spray gun with Rotoclean tip and tungsten carbide orifices of .017 - .026" and 25-60° fan angle is recommended. Adjust material pressure between 1200-2500 psi as required.

Equivalent equipment by other manufacturers is acceptable.

ISH OR ROLLER will generally require additional .. ,lications in order to obtain the recommended millage. Use short nap rollers and medium stiff natural bristle brushes. Thin with small amount of T-460 Solvent if required.

MIXING: Add Catalyst Component 'B' into Resin Component 'A' and mix thoroughly with mechanical agitation. Material will become much thinner when mixed. Add minimum quantites of solvent only if required. OBSERVE POT LIFE LIMITATIONS. If material thickens in pot at end of pot life, discard material and flush pot and lines.

THINNING: Generally not required nor recommended. May use up to 4 oz. of T-470 per gal. at temperatures between 10 - 60°F.

CLEAN UP: Use MEK, other ketone solvents or Ceilcote T-410 Solvent.

RECOAT/CURING TIME:

To Recoat	To Handle
@25°F. - 48 hrs.	@25°F. - 48 to 72 hrs.
@50°F. - 15 hrs.	@50°F. - 18 to 24 hrs.
@75°F. - 4 hrs.	@75°F - 6 to 12 hrs.
ɔ°F. - 3 hrs.	@90°F. - 4 hrs.

May be recoated up to 30 days. After 30 days, sand or sweep blast to remove gloss and roughen surface for proper adhesion.

POT LIFE: @25°F. - 12 hrs.
@50°F. - 5 to 6 hrs.
@75°F. - 2 to 3 hrs.
@90°F. - 45 min. to 1 hr.

STORAGE: Store in a cool, dry place (40-90°F.) and away from direct sunlight, flame, or other hazards.

MATERIAL RETURNS: All returns must be approved by Ceilcote in writing prior to shipment and must be shipped prepaid at customer's expense to a designated warehouse. Customer must advise date of shipment and invoice number when requesting returns. Only unopened cans containing usable materials which have not exceeded shelf life from date of sale can be accepted. Returns are subject to a 20% restocking charge plus any additional charges required for repackaging.

SAFETY: WARNING - FLAMMABLE LIQUID. Vapor may be harmful. Contains epoxy resins, amine catalyst, petroleum distillate and ester solvents. May cause skin sensitation or other allergic responses. Keep away from heat, sparks, or open flame. In enclosed areas or where ventilation is poor, use an approved air mask and utilize adequate safety precautions to prevent fire or explosion. In case of skin contact, wash with soap and water. For eyes, flush immediately (seconds count) with water for 15 minutes and CALL A PHYSICIAN. If swallowed, do not induce vomiting - CALL A PHYSICIAN IMMEDIATELY.

The technical data furnished herein is true and accurate to the best of our knowledge; however, no guarantee of accuracy is given or implied. Ceilcote assumes no responsibility for any loss or damage resulting from the handling or use of the products by the buyer. Seller warrants only that the products to be delivered will conform to Ceilcote's manufacturing standards. In no event shall Ceilcote be responsible for consequential damages of any such breach of warranty including, but not limited to, the Buyer's loss of material or profits, increased expense of operation, down-time or reconstruction of the work and, in no event shall the Ceilcote obligation under this warranty exceed the price of the defective material.

THIS WARRANTY IS IN LIEU OF ANY OTHER WARRANTY OR OBLIGATION, EXPRESSED OR IMPLIED, AND NO LIABILITY IS ASSUMED BY THE CEILCOTE COMPANY, EXCEPT AS IS EXPRESSLY STATED ABOVE.

Statements concerning the use of products are not to be construed as recommending the infringement of any patent, and no liability for infringement arising out of such use is assumed by Ceilcote.

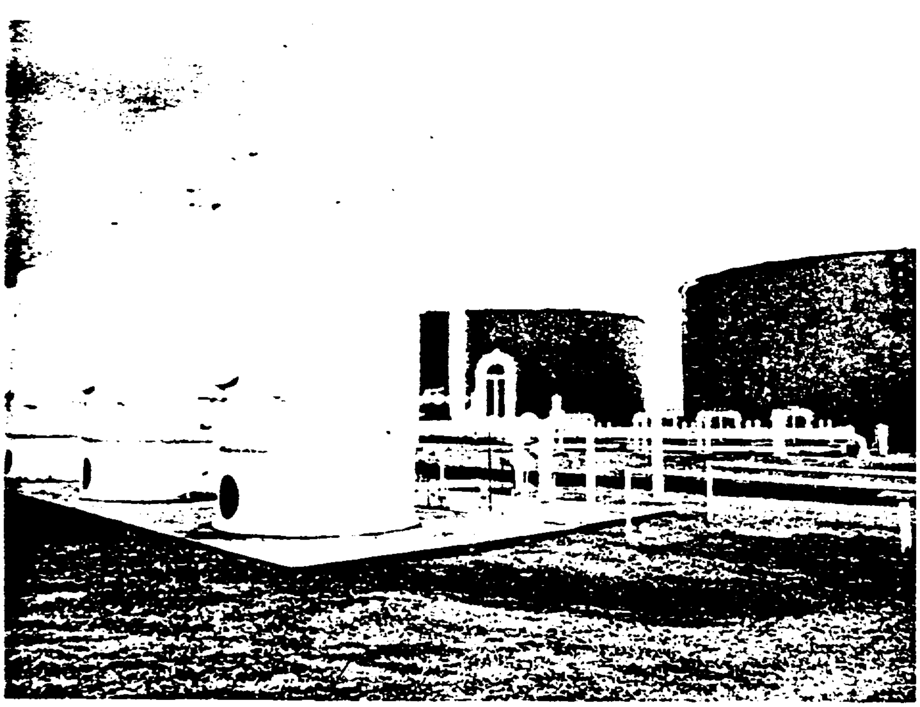
THE CEILCOTE CO.
A UNIT OF GENERAL SIGNAL
140 SHELDON ROAD
BEREA, OHIO 44017
(216) 243-0700

CEILCOTE

coatings

Flakeprime™ Flakeline® 600 Flaketar™

- **Flake-reinforced** for low permeability and high strength.
- **Low temp. cure** permits coating down to 10°F.
- **Moisture-tolerant** — expands range of application environments.
- **Low permeance** — over 10 times lower than conventional thin films for longer service life.
- **Exceptional acid-resistance** for service in a broad range of hostile environments.
- **High build** — more thickness with fewer coats reduces application costs.



Designed to deliver higher performance at lower cost

Ceilcote's flake-reinforced epoxy coating systems are unique — and uniquely cost-effective on both steel and concrete. Their proprietary formulations not only provide extraordinary longevity in a wide variety of corrosive environments, they also offer significant savings in installation costs.

The most obvious is the benefit of their high build characteristic. You get all the thickness you need in fewer applications. Usually 2 coats instead of 3.

And these Ceilcote coatings can be applied under conditions which would cause delay or other expense with other products. They are moisture-tolerant. They will cure in the presence of moisture.

Because of a proprietary catalyst system developed by Ceilcote, these coatings can be applied — and will cure properly — at temperatures substantially below freezing. The addition of Ceilcote LTC Accelerator improves recoat time and handling time. (See next page for approximate curing times at various temperature ranges.)

In performance, too, these Ceilcote systems offer advantages over conventional coatings. Ceilcote's advanced flake pigmentation technology results in exceptionally low permeance. They resist moisture 8 to 10 times better than conventional thin-film coatings, 4 to 5 times better than a fiberglass mat/resin laminate.

Special amine adduct curing agents also contribute to their resistance to solvents, grease, oils, dilute acids, alkalis and many other chemicals and corrosive agents.

They have proved effective in chemical and fertilizer plants, metal finishing operations, refineries, breweries, canneries, paper mills, shipyards, oil and gas installations including offshore rigs.

Ceilcote flake-reinforced coatings meet Rule 66 and other air emission requirements.

Flakeprime™

Amine Adduct Rust Inhibitive, Catalyzed Epoxy Primer

A unique epoxy primer for steel or concrete surfaces, offering application and performance properties not available in any other product. In addition to its ability to cure at low temperatures, Flakeprime will cure in the presence of moisture.

It provides the best properties of both amine and polyamide cure systems — flexibility combined with a hard, durable surface. Flakeprime's cured film features overlapping layers of micro-thin flake pigments, resists moisture penetration and provides exceptional corrosion inhibition, excellent adhesion and resistance to undercutting, electrolysis and cathodic disbondment. It is the ideal primer for Flakeline 600 and Flaketar. It can be used *alone* as an epoxy mastic; it will build to 5-6 mils. It offers excellent adhesion to *hand-cleaned* as well as sandblasted surfaces, making it an ideal maintenance product.

Flakeline® 600

Amine Adduct Epoxy Coating

A high build, flake-filled epoxy topcoat providing exceptional chemical resistance to alkalis, inorganic acids and many aromatic and aliphatic solvents. It gives corrosion protection in chemical fumes, spillage or marine environments. Flakeline 600 features Ceilcote's unique curing system that permits application at temperatures well below freezing and in the presence of moisture.

It is recommended for protecting structural steel, piping, tanks or equipment. It may also be used as a lining in water or mild chemical solutions.

Flaketar™

Amine Adduct Coal Tar Epoxy Coating

Another Ceilcote development combining the overlapping flake principle with an amine adduct-cured coal tar epoxy, Flaketar provides unique resistance to moisture permeation and to a broad range of chemicals. And, because Flaketar LTC will cure at temperatures as low as 10°F, it is uniquely useful in field applications requiring painting in cold weather. It also offers extended recoatability time — up to 30 days! Flaketar is recommended for below-grade applications such as sewer lines, piping and buried equipment like underground transformers, as well as for lining oil field surface equipment, waste water tanks and chemical process equipment.

NOTE: For low-temperature applications, order Flakeprime LTC, Flakeprime 600 LTC, Flaketar LTC. These systems include Ceilcote LTC Accelerator.

General Product Data

Moisture-Tolerant Cure

All Flakeline epoxy systems have a uniquely moisture-tolerant curing system. It permits you to coat under conditions that stop the application of conventional systems. It lets you use wet methods of surface preparation*, like hydroblasting. It allows you to store work-in-progress outside without fear of losing that day's coating. All this not only means greater productivity, but greater probability of a top-quality job. You can expect recoat work to be dramatically reduced or virtually eliminated. Fewer painting schedules will be delayed; more projects will be completed on time, within budget.

*Special precautions must be taken to assure removal of all excess water from substrate before applying product.

Low-Temperature Cure

The low-temperature curing properties of Flakeline epoxy systems permit you to extend your painting season well into winter. As with moisture-tolerant cure, low temperature cure offers you both productivity and quality advantages. With the addition of Ceilcote's LTC Accelerator, curing times are cut in half. Even without LTC Accelerator, Ceilcote Flakeline epoxies will continue to cure when temperatures drop well below freezing. When you use Ceilcote Flakeline epoxy systems on projects like waste water treatment plants, you avoid delays and meet installation deadlines. Low temperature coating work does require special application considerations. Ask for Low-Temperature Cure application instructions.

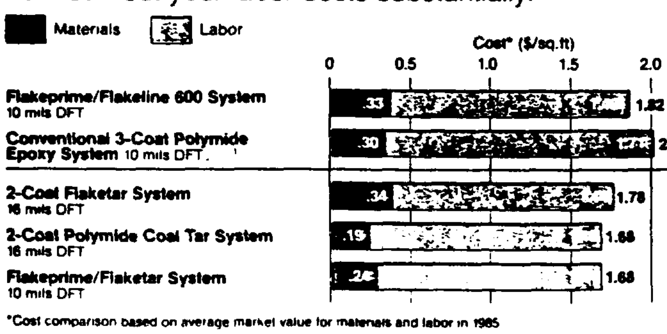
Recoat and Curing Time Guide

	Time to Recoat* (Hours)				Time to Handle* (Hours)			
Product/Substrate Temperature	25°F	50°F	70°F	90°F	25°F	50°F	70°F	90°F
Standard Formulation								
Flakeprime	12-18	6-8	3	1	48	16-24	8	4
Flakeline 600	48	15	4	3	48-72	18-24	8-12	4
Flaketar	24-48	6-12	4	3	36-72	24-36	12-16	6-12
With LTC Accelerator								
Flakeprime LTC	6-10	3-4	1.5	0.5	24	8-12	4	2
Flakeline 600 LTC	24	7-8	2	1.5	24-36	9-12	3-6	2
Flaketar LTC	12-24	3-6	2	1.5	18-36	12-18	6-8	3-6

*Recoat and handle times are approximate, subject to actual conditions.

Compare Flakeline Systems with Conventional Coating Systems

Compare a project's total costs, materials *and* labor, and you often find you *save* money by choosing premium grade materials like Flakeline 600 and Flaketar. Both can cut your labor costs substantially.



*Cost comparison based on average market value for materials and labor in 1985

You can build a 10 to 12 DFT with one coat of Flakeprime and one finish coat of Flakeline 600. Conventional polyamide high build systems, typically applied at 4 to 5 dry mils, require a total of 3 coats, a primer coat plus two finish coats. The labor savings of one coat results in an overall cost savings of about 10%. (See cost comparison chart.)

Flaketar's ease of application and recoatability save labor and bring the overall cost within 5 to 6%, a modest additional cost for a premium performer. Or, by using Flakeprime to enhance adhesion, resistance to undercutting, and resistance to electrolysis and cathodic disbondment — and topping with one coat of Flaketar — the overall cost will be virtually the same as a conventional two-coat polyamide coal tar system. (See cost comparison chart.)

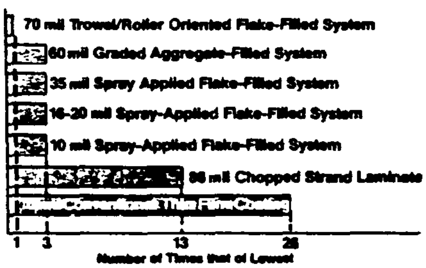
Permeability & Permeance

The permeability of a coating is its moisture transmission rate, and it is a critical performance factor in determining service life. Whether the coating is applied for atmospheric conditions, splash/spillage or immersion, its permeability determines how fast oxidation will take place at the steel substrate and how soon eventual blistering and peeling will occur. Obviously, the lower the permeability the better.

Permeance is the moisture transmission rate of the coating system after taking into account its thickness. The higher the build of dry film thickness, the lower the permeance. Combining high build characteristics with very low permeability results in very low permeance and greater longevity.

Testing for a system's ability to resist moisture transmission (or to have very low permeance) is done by a variety of methods depending upon the type of service. For atmospheric conditions three tests are used: Accelerator Weathering Test (ASTM G53-77), Salt Fog Cabinet Test (ASTM B117), and Humidity Resistance Test (ASTM D1735). For immersion service, ASTM C868-77 Test Cell for Linings is required to determine the maximum immersion temperatures for various lining systems. Splash/spill environments are determined by evaluating the ASTM tests for atmospheric conditions combined with the ASTM C868-77 Test Cell.

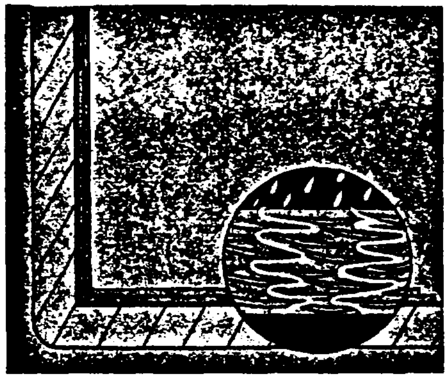
Relative Permeability Comparison
(Lower is better)



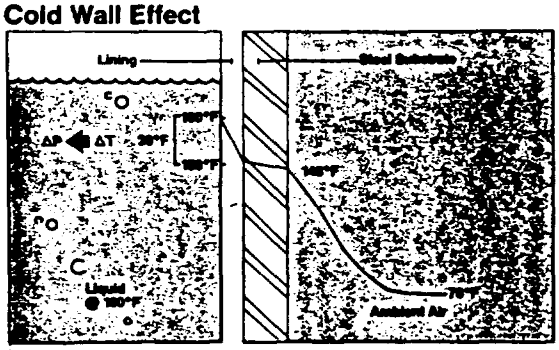
Water Vapor Transmission rate can be determined in quantitative terms by using ASTM E96 Test for Permeability. This permeability information is very important in comparing relative performance potential of various coating systems. For instance, when you compare a 10-mil Flakeline 600 system with a 10-mil conventional Thin Film coating system, the conventional system has 9.8 times greater permeability than the Flakeline system. Likewise, comparing the equivalent thickness of Flaketar with a conventional coating system results in 8.4 times greater permeability than the conventional coating system. Flakeline's dramatic advantages in permeability deliver longer service life and lower cost per year for your corrosion protection.

Cold Wall Effect

Cold wall effect is a force created by the difference in temperature between the inside and outside of a tank. The temperature differential causes a pressure differential between the exposed surface of the lining and the surface where it meets the steel substrate. This pressure differential creates a driving force for water molecules to pass through (permeate) the lining system to the steel substrate where oxidation begins. A lining system's barrier effect resists this driving force of cold wall effect. This resistance is expressed in terms of permeance. This effect is a very important consideration for steel tank linings. It is their permeance that determines their ability to resist the driving force of cold wall effect. ASTM 868C Test Cell duplicates this effect. Maximum operating temperature for various lining systems are determined by using the test cell as a qualifying parameter. See the Reference Chart showing typical maximum operating temperatures for various lining and coating systems.



Cold Wall Effect



Maximum Immersion Temperature

Thin-Film (No Flake)	100°F
Chopped Strand Laminate	110°F
16 to 20 mil Flake-Filled	120°F
35 mil Flake-Filled (Std.)	130°F
35 mil Flake-Filled (Special)	150°F
125 mil Graded Aggregate/Glass Cloth Reinforced	160°F
150 mil Graded Aggregate/Glass Mat Reinforced	160°-180°F
70 mil Flake-Filled	180°F-200°F

Product Guide

Product	Generic Type	% Solids By Volume	Maximum Dry Service Temp. °F	Theoretical Coverage @ 1 mil DFT (Sq.ft./Gal.)	Dry Film Thickness mils	Drying Time (Hours) To Touch	Drying Time (Hours) To Recoat	Drying Time (Hours) To Handle	Flash Point PMCC °F
Flakeprime	Epoxy Adduct	73	350	1170	2-3	2	3	8	65°
Flakeline 600	Epoxy Adduct	83	350	1330	6-8	3-4	4	6-12	61°
Flaketar	Coal Tar Epoxy Adduct	80	325	1283	7-8	2	4	12-16	44°

System Guide

Coating Systems			Systems Thickness				Atmosphere				Splash & Spill				Immersion (Dilute Service)				
Primer	Intermediate Coat	Topcoat	Primer	Intermed. Coat	Top-coat	Total	Acids	Alkalis	Oxidants	Solvents	Acids	Alkalis	Oxidants	Solvents	Acid	Alkalis	Oxidants	Solvents	Water
Flakeprime	N/A	N/A	5	N/A	N/A	5	G	VG	L	L	NR	NR	NR	NR	NR	NR	NR	NR	L
Flakeprime	N/A	Flakeline 600	2	N/A	8	10	E	E	L	G	G	VG	NR	F	L	F	NR	L	VG
Flakeprime	Flakeline 600	Flakeline 600	2	8	8	18	E	E	L	G	VG	E	NR	G	G	E	NR	F	E
Flakeprime	N/A	Flaketar	2	N/A	8	10	E	E	L	L	VG	E	NR	NR	L	F	NR	NR	VG
Flakeprime	Flaketar	Flaketar	2	8	8	18	E	E	L	L	VG	E	NR	NR	G	VG	NR	NR	E
N/A	Flaketar	Flaketar	N/A	8	8	16	E	E	L	L	VG	E	NR	NR	F	G	NR	NR	G

**Use where color, gloss stability and stain resistance are important.*

E— Excellent
VG— Very Good
G— Good
F— Fair
L— Limited
P— Poor
NR— Not Recommended

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CEILCOTE

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CEILCOTE

Monolithic Linings

Monolithic Flooring

Industrial Coatings

Organic Grouting

Acid Proof Brick, Mortars and Membranes

FRP and Thermoplastic Laminates

Ceilcote Master Corrosion Resistance Guide

Introduction

The Ceilcote Master Corrosion Resistance Guide is designed to assist those responsible for proper material selection.

Over 340 corrosive environments are classified by their effect on Ceilcote corrosion-resistant materials, as determined by laboratory tests, field experience and performance criteria.

Because of the complexity of most installations in corrosive service and the possible exposure to contaminants and conditions not considered in laboratory tests, it is to your benefit that Ceilcote be consulted for specific recommendations before final selection and installation.

The general guidelines for the use of any of these materials for the corrosives indicated do not constitute direct or implied warranties.

How to use this guide

EXAMPLE: A tank handling chrome plating solution at 140°F. Problem: Select the best combination of materials to protect the tank interior and exterior, floor and trench and specify the needed ventilation equipment (scubber, fan, duct, hoods and stack).

1. Tank Lining.

Locate "chrome plating (20-42 oz/gal.)" in the "Corrosive Environment" column on page 6. This category covers the normal range of solutions found in this service. Check the ratings in the linings section for this particular corrosive environment. The "lining series" rated best for this service is designated C-1. As in the key below, C-1 indicates recommendation to a maximum 140°F. (60°C) for immersion or constant flow conditions.

2. Tank Exterior Protection.

The Coatings Selection Guide on page 17 refers to column "Acids" and "Oxidants" (since chrome plating solution is an oxidizing acid) under the splash and spill columns. The polyester coatings (Fl. 200 series and 300) are rated excellent or better in these services and are listed also in the main chart.

Refer again to "chrome plating 20-42 oz./gal." listing on page 6. Under the coatings column, Flakeline® 200 Series can be selected for the tank exterior. The C-2 rating indicates good to a maximum of 140°F for intermittent splash or spillage. Note that Fl. 300 is rated C-3 and is recommended for fumes only.

3. General Process Area — walls, enclosures and structural protection.

These surfaces will be exposed to the corrosive fumes resulting from the processes identified, but will not be subjected to immersion or direct splash or spillage.

As previously indicated, Fl. 300 has been given a C-3 rating and would be suitable for these surfaces. For alternate coatings selection, refer to Step 2. In this case, vinyl coatings would be another possibility.

4. Flooring and Trenches.

In the floor topping section, the Ceilcrete® Series is given the best recommendation with a C-2 rating indicating maximum 140°F temperature for immersion or spillage conditions. This material should be used for the flooring and the trenches.

5. Exhaust and Scrubber Systems, Tanks and Piping.

The Duracor® FRP laminate and Duracor FRP Thermoplastic laminate sections allow you to select a suitable material for this service.

Note that both the chlorinated polyester and the vinyl ester are rated the highest with C-1 ratings (140°F for immersion or constant flow conditions). Most of the thermoplastic laminates are rated A-1.

Splash or spillage or fume conditions would normally be rated to higher temperatures. Consult Ceilcote for a specific recommendation.

6. CONFIRMATION.

It will be necessary to confirm the selection with Ceilcote because there are several product numbers in most series. **A given rating does not necessarily apply to every member of a series.**

Key to Chemical Resistance Chart

Rating	Meaning
A	Good to maximum temperature of Ceilcote product. In many cases, the maximum temperature recommendation varies for the type of substrate or type of service. See the temperature limit chart (opposite page).
B	Good to 160° F (71° C). 160° F is the maximum recommended use temperature.
C	Good to 140° F (60° C). 140° F is the maximum recommended service temperature.
D	Good to 100° F (38° C). This rating is generally used for ambient temperature conditions.

1. Immersion or constant flow — This condition applies to tank linings or floor or trench areas where leakage or spillage causes constant flow conditions.
2. Intermittent splash or spillage — This condition applies to floors and other surfaces which will be intermittently wetted with the corrosive environment, but that proper housekeeping is observed to clean up spills.
3. Fumes only — As indicated, fumes or vapors without any direct splash or spillage.

T. Varies with conditions, and may require tests. Consult Ceilcote for recommendation — This recommendation requires testing or further information on actual exposure conditions.

N. Not recommended — Use of the product is not recommended for the designated corrosive environment.

Temperature Limits of Ceilcote Products

(Wet Service unless Indicated Dry)

Linings	Steel Substrate °F	Approx. °C	Concrete Substrate °F	Approx. °C
Ceilcrete® Series	160	71	160	71
Coroline® Series	180	83	160	71
Lining Series	160	71	160	71
Flakeline® 100 Series	180	83	N	N
Heavy-Duty Coatings	Steel Substrate (Immersion or Wet Fumes and Spillage) °F	Approx. °C	Steel Substrate (Dry Service) °F	Approx. °C
Flakeline® 222HT	150	65	350	176
Flakeline® 200 Series (Except 222HT)	130	49	300	148
Flakeline® 300 Series	120	49	220	105
Flaketar™	120	49	220	105
Flakeline® 600 Series	120	49	220	105
Floor Toppings	Concrete Substrate Constant Flow °F	Approx. °C	Concrete Substrate Intermittent Spillage °F	Approx. °C
Ceilcrete®	160	71	300	148
Coroline® Series	170	76	300	148
681 Floor	170	76	250	121
682 Floor	180	83	300	148
683 Floor	140	60	200	93
685 Floor	180	83	250	148
687 Floor	160	71	300	148
Corocrete SR	140	60	200	93
Mortars and Membranes for Acid Proof Brick	Constant Immersion °F	Approx. °C	Intermittent Spillage °F	Approx. °C
Bric-Bond™	180	83	220	104
Compo-Bond®	750	398	1000	537
Corobond™	350	176	400	204
Polyester	250	121	350	176
Epoxy	200	93	300	148
Ceilcote® 8300 Series, HM 195	140	60	—	—
Duracor® FRP Laminates	Immersion °F	Approx. °C	Fumes °F	Approx. °C
Isophthalic Polyester	160	71	200	104
Bisphenol Polyester	220	104	250	121
Chlorinated Polyester	220	104	350	176
Vinyl Ester	220	104	400	204
Epoxy	160	71	180	82
Furan	250	121	350	176

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CEILCOTE

Corrosive Environment Tables

	LININGS				COATINGS					FLOOR TOPPINGS						
	Flakeline 100 Series	Lining Series	Ceilcrete Series	Coroline Series	Flakeline 200 Series	Flakeline 222HT	Flakeline 300	Flakeline 600	Flaketar	Ceilcrete Series	Coroline Series	681, 685 Floors	682, 683 Floors	687 Floors	Corocrete SR	Sealants
Acetaldehyde	T	T	T	T	T	T	N	N	N	D2	D2	T	N	D2	N	N
Acetic Acid - 10%	C1	C1	C1	T	D1	D1	D3	N	D2	A2	D2	D2	D2	B2	N	D2
Acetic Acid 1-50%	D1	D1	D1	N	D2	D2	D3	N	D3	C2	N	N	N	C2	N	N
Acetic Acid 50% to (Glacial)	T	D1	D1	N	C2	C2	D3	N	N	D2	N	N	N	D2	N	N
Acetic Anhydride	D1	D1	D1	N	T	T	D3	N	N	D2	N	N	N	D2	N	N
Acetone	T	T	T	T	D2	D2	T	N	N	D2	D2	D2	D2	D2	D2	T
Acetyl Bromide	T	T	T	T	N	N	T	N	N	D2	T	N	N	T	N	N
Acetyl Chloride	T	T	T	T	T	T	T	N	N	D2	D2	N	T	T	N	N
Acrylic Acid	D1	D1	D1	T	T	T	D2	N	N	D2	T	N	N	D2	[illegible]	N
Acrylonitrile	T	N	T	N	N	N	N	N	N	T	N	N	N	T	N	N
Adipic Acid - 25%	D1	D1	D1	D1	D1	D1	D2	T	T	D2	D2	D2	D2	D2	T	T
Allyl Alcohol	D1	D1	D1	T	D1	D1	T	T	N	D2	T	T	T	T	T	T
Allyl Chloride	D1	D1	D1	T	D1	D1	T	N	N	D2	T	N	T	T	N	N
Alum (Saturated Solution)	C1	C1	C1	C1	D1	D1	D1	D2	D1	A2	A2	A2	A2	B2	D2	A2
Aluminum Bromide	A1	A1	A1	T	D1	D1	D1	D1	D1	A2	A2	A2	D2	B2	D2	A2
Aluminum Chloride	A1	A1	A1	D1	D1	D1	D1	D1	D1	A2	A2	A2	A2	B2	D2	A2
Aluminum Fluoride*	T	D1	A1	A1	C2	C2	C2	T	A2	A2	A2	D2	A2	D2	D2	A2
Aluminum Sulfate	C1	C1	C1	C1	D1	D1	D1	D1	D1	A2	A2	A2	A2	B2	C2	A2
Ammonia (Dry)	C1	C1	C1	A1	D3	D3	T	C3	C3	C2	A2	D3	A2	A3	D3	D3
Ammonium Chloride	A1	A1	A1	A1	D1	C1	D1	D1	D1	A2	A2	A2	A2	A2	C2	A2
Ammonium Cocoampholyte - 30%	C1	C1	C1	C1	D1	D1	D2	D2	D2	A2	A2	D2	A2	D2	D2	D2
Ammonium Fluoride*	T	C1	A1	A1	D1	D2	D2	T	T2	C2	C2	D2	D2	C2	T	D2
Ammonium Hydroxide - 20%	D1	C1	C1	B1	D1	C1	N	D2	D2	C2	A2	D2	A2	B2	D2	A2
Ammonium Lauryl Sulfate - 30%	D1	D1	D1	D1	D1	D1	D2	D2	D2	C2	C2	D2	C2	C2	D2	D2
Ammonium Nitrate	A1	A1	A1	A1	D1	C1	D1	D1	D1	A2	A2	A2	A2	A2	C2	A2
Ammonium Persulfate	A1	A1	A1	D1	D1	C1	D1	D1	D1	A2	D2	A2	D2	B2	D2	D2
Ammonium Sulfate	A1	A1	A1	A1	D1	C1	D1	D1	D1	A2	A2	A2	A2	A2	C2	A2
Ammonium Sulfide	A1	A1	A1	A1	D1	C1	N	D1	D1	A2	A2	A2	A2	A2	C2	D2
Ammonium Sulfite	A1	A1	A1	A1	D1	C1	D1	D1	D1	A2	A2	A2	A2	A2	C2	A2
Ammonium Xylene Sulfonate - 40%	C1	C1	C1	C1	D1	C1	C2	D2	T	C2	C2	D2	D2	C2	D2	D2
Amyl Acetate	D1	D1	D1	T	D1	D1	N	N	N	D2	D2	N	D2	D2	N	T
Amyl Alcohol	C1	C1	C1	D1	D1	C1	D2	N	D2	A2	D2	C2	C2	C2	D2	D2
Aniline	D1	D1	D1	N	D1	D1	N	N	N	D2	D2	N	N	T	N	N
Aniline Hydrochloride	D1	D1	D1	C1	D1	D1	D2	N	N	D2	C2	D2	C2	T	N	D2
Anodizing-Chromic	See Chromic Acid - 10%															
Anodizing-Sulfuric	See Sulfuric Acid - 20-50%															
Antimony Chloride (tri)	A1	A1	A1	C1	D1	C1	C2	C2	C2	A2	A2	A2	A2	B2	C2	A2
Aqua Regia	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N
Arsenous Acid	D1	C1	A1	T	D1	C1	C2	T	T	C2	A2	D2	A2	T	D2	D2
Barium Chloride	A1	A1	A1	C1	D1	C1	C2	C2	D2	A2	A2	A2	A2	A2	C2	A2
Barium Hydroxide	D1	D1	C1	A1	D1	C1	N	D1	D1	C2	A2	A2	A2	A2	C2	A2
Barium Sulfide	A1	A1	A1	B1	D1	C1	C2	D1	D1	A2	A2	A2	A2	A2	C2	D2
Benzal Chloride	T	T	T	D1	T	T	T	T	N	D2	D2	T	T	D2	T	T
Benzaldehyde	T	T	T	T	T	T	N	N	N	D2	D2	N	T	D2	N	T
Benzene (Benzol)	D1	D1	D1	D1	D1	D1	N	N	N	D2	D2	D2	D2	D2	D2	N
Benzene Sulfonic Acid 50-100%	C1	C1	C1	T	D1	C1	T	N	N	A2	D2	D2	D2	C2	D2	D2
Benzene Thiol	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N
Benzyl Alcohol	D1	D1	D1	D1	D1	C1	N	T	T	D2	C2	D2	D2	D2	D2	D2
Benzoic Acid	A1	A1	A1	C1	D1	C1	C2	D2	D1	A2	C2	A2	A2	T	T	A2
Benzoyl Chloride	T	T	T	D1	T	T	T	T	T	C2	D2	D2	D2	T	T	T
Benzyl Chloride	T	T	T	D1	T	T	T	T	T	D2	D2	D2	D2	A2	D2	N
Black Liquor (Paper)	C1	C1	C1	A1	D1	C1	C2	C2	D2	A2	A2	A2	A2	B2	C2	A2
Boric Acid	B1	C1	C1	C1	D1	C1	C2	C2	D2	D2	D2	D2	D2	A2	N	A2
Bromine, Wet Gas	D3	D3	D3	N	D3	D3	N	N	N	D3	T	N	N	T	N	N
Bromine, Dry Gas	D3	D3	D3	N	D3	D3	N	N	D3	D3	T	N	N	T	N	N
Bromine Water - 5%	D1	D1	D1	N	D1	D1	N	N	N	C2	T	N	N	T	N	N
Butanol	C1	C1	D1	C1	D1	D1	D2	N	N	D2	C2	D2	D2	D2	D2	D2
Butyl Acetate	D1	D1	D1	T	D1	D1	N	N	N	D2	D2	N	D2	T	N	N

* Duracor requires synthetic veil for fluorides, caustics and hypochlorites. Other products may require carbon filler.

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CEILCOTE

Corrosive Environment Tables

	MORTARS MEMBRANES						GROUTS		DURACOR® FRP LAMINATES						DURACOR THERMOPLASTIC LAMINATES				
	Bric Bond (Reg.) & Carbon	Compobond	Corobond	Polyester	Epoxy	Ceilcote 8303, 8305, HM 195	640 Grout	Epoxy Grouts	Isophthalic Polyester	Bisphenol Polyester	Chlorinated Polyester	Vinyl Ester	Epoxy	Furan	Polyvinyl Chloride (PVC)	Polyvinyl Dichloride (CPVC)	Polypropylene (PP)	Kynar (PVDF)	Armalon (Teflon)
Acetaldehyde	D2	A1	A1	D2	D2	N	D2	D2	N	N	N	T	T	D1	N	N	D1	C1	C1
Acetic Acid - 10%	C1	A1	A1	B1	C2	D1	B2	D2	D1	B1	B1	B1	N	A1	C1	C1	A1	A1	A1
Acetic Acid 1-50%	D2	A1	A1	D1	N	N	C2	N	D2	C1	D1	B1	N	D1	C1	C1	C1	A1	A1
Acetic Acid 50% to (Glacial)	N	A1	A1	D2	N	N	D2	N	N	D1	T	D1	N	A1	N	N	D1	B1	A1
Acetic Anhydride	D2	A1	N	D2	N	N	D2	N	D3	D1	D2	D1	N	D1	N	N	N	C1	A1
Acetone	N	A1	A1	T	D2	N	D2	D2	N	T	N	T	T	D1	N	N	C1	N	C1
Acetyl Bromide	D2	A1	T	T	T	N	T	D2	D3	T	D3	T	D3	N	N	N	N	D1	C1
Acetyl Chloride	D2	A1	A1	T	D2	N	T	D2	T	T	T	T	N	D1	N	N	N	D1	C1
Acrylic Acid	N	A1	A1	D1	T	N	D2	N	D3	D1	T	D1	N	D1	N	N	N	C1	A1
Acrylonitrile	N	A1	A1	N	N	N	T	N	N	N	N	T	N	B1	N	N	N	D1	B1
Adipic Acid - 25%	D1	D1	D1	D1	D1	D1	D2	D2	D1	D1	D1	B1	D1	D1	A	A	A1	A1	A1
Allyl Alcohol	T	A1	A1	D1	T	T	T	T	N	N	N	D1	T	D1	D1	D1	D1	A1	A1
Allyl Chloride	N	A1	D1	D1	T	N	T	T	N	T	N	D1	T	D1	N	N	A1	A1	A1
Alum (Saturated Solution)	C1	A2	A1	C1	C1	D1	B2	A2	D1	C1	C1	C1	C1	A1	N	A	A1	A1	A1
Aluminum Bromide	C1	A1	C2	A1	T	A1	B2	A2	C1	B1	C1	B1	A2	D1	A1	A1	A1	A1	A1
Aluminum Chloride	A1	A1	A1	A1	D1	A1	B2	A2	C1	A1	C1	A1	D1	A1	A1	A1	A1	A1	A1
Aluminum Fluoride*	A1	N	A1	A1	A1	D1	D2	D2	C1	A1	C1	A1	D1	A1	A1	A1	A1	A1	A1
Aluminum Sulfate	A1	A1	A1	C1	C1	D1	B2	A2	C1	C1	C1	C1	C1	A1	A1	A1	A1	A1	A1
Ammonia (Dry)	N	N	A1	C1	A1	A1	B2	A3	N	A1	N	A1	A1	A1	D1	B1	B1	B1	A1
Ammonium Chloride	C1	D1	A1	A1	A1	A1	A2	A2	A1	A1	A1	A1	A1	A1	A1	A1	A1	A1	A1
Ammonium Cocoampholyte - 30%	A1	N	A1	A1	D1	T	C2	C2	C1	B1	B1	B1	C1	A1	B1	B1	B1	A1	A1
Ammonium Fluoride*	D2	N	A1	C1	C1	D1	D2	D2	C1	C1	C1	C1	C1	A1	A1	A1	A1	A1	A1
Ammonium Hydroxide - 20%	N	N	A1	A1	A1	A1	B2	A2	N	C1	C1	C1	B1	A1	A1	A1	A1	A1	A1
Ammonium Lauryl Sulfate - 30%	C2	T	A1	C1	C1	T	C2	C2	C1	C1	C1	C1	C1	B1	A1	A1	A1	A1	A1
Ammonium Nitrate	C1	A1	A1	A1	A1	A1	A2	A2	C1	A1	A1	A1	A1	D1	A1	A1	A1	A1	A1
Ammonium Persulfate	A1	D1	D1	A1	A1	A1	B2	D2	C1	B1	C1	B1	D1	D1	A1	A1	A1	A1	A1
Ammonium Sulfate	C1	A1	A1	A1	A1	A1	A2	A2	C1	A1	A1	A1	A1	A1	A1	A1	A1	A1	A1
Ammonium Sulfide	D1	N	A1	A1	A1	A1	A2	A2	N	D1	D1	D1	C1	A1	A1	A1	A1	A1	A1
Ammonium Sulfite	D1	N	A1	C1	A1	A1	A2	A2	D1	A1	C1	A1	D1	A1	A1	A1	A1	A1	A1
Ammonium Xylene Sulfonate - 40%	D2	N	A1	C1	C1	T	C2	C2	C1	B1	B1	B1	C1	A1	D1	D1	D1	A1	A1
Amyl Acetate	N	A1	A1	D1	T	N	D2	D2	N	D1	T	D1	T	D1	N	N	N	C1	A1
Amyl Alcohol	N	A1	A1	D1	D1	N	C2	A2	D1	B1	B1	B1	C1	D1	N	N	A1	B1	A1
Aniline	N	A1	A1	D1	N	N	T	N	N	T	T	D1	N	C1	N	N	A1	D1	A1
Aniline Hydrochloride	C2	A1	A1	D1	C1	D1	T	C2	N	B1	D1	D1	C1	C1	N	N	A1	A1	A1
Anodizing-Chromic																			
Anodizing-Sulfuric																			
Antimony Chloride (tri)	A1	A1	A1	D1	C1	A1	B2	A2	C1	A1	A1	A1	C1	A1	A1	A1	A1	A1	A1
Aqua Regia	D2	A1	N	N	N	N	N	N	N	N	N	N	N	N	N	D1	N	D1	B1
Arsenous Acid	A1	A1	A1	C1	T	A1	T	A2	D1	B1	B1	B1	T	A1	A1	A1	A1	A1	A1
Barium Chloride	A1	A1	A1	A1	C1	A1	A2	A2	C1	A1	A1	A1	C1	A1	A1	A1	A1	A1	A1
Barium Hydroxide	N	N	A1	D1	A1	A1	A2	A2	N	C1	D3	C1	A1	A1	A1	A1	A1	A1	A1
Barium Sulfide	N	N	A1	A1	A1	A1	A2	A2	C3	A1	C3	A1	D1	A1	A1	A1	A1	A1	A1
Benzal Chloride	T	A1	A1	T	D1	N	T2	D2	N	T	T	T	D1	C1	N	N	D1	T	A1
Benzaldehyde	N	A1	A1	D2	D1	N	D2	T	N	D3	D3	D3	T	C1	N	N	D1	D1	A1
Benzene (Benzol)	D2	A1	A1	D	D1	N	D2	D2	N	D1	D1	D1	D1	A1	N	N	N	C1	A1
Benzene Sulfonic Acid 50-100%	C1	A1	A1	A1	T	D2	C2	D2	N	A1	D1	C1	T	A1	N	N	D1	A1	A1
Benzene Thiol	N	A1	C2	N	N	N	N	N	N	N	N	N	N	D1	N	N	D1	A1	A1
Benzyl Alcohol	D2	A1	A1	A1	D1	D1	D2	D2	N	D1	T	C1	T	B1	N	N	D1	A1	A1
Benzoic Acid	C1	A1	A1	C1	C1	D1	D2	A2	C1	A1	A1	A1	C1	A1	D1	D1	D1	A1	A1
Benzoyl Chloride	N	A1	A1	D2	D1	N	D2	D2	N	N	N	D2	D1	D1	N	N	N	A1	A1
Benzyl Chloride	N	N	A1	A1	A1	N	T	D2	N	T	N	T	D1	D1	N	N	D1	A1	A1
Black Liquor (Paper)	B1	A1	A1	A1	A1	A1	A2	A2	N	A1	T	A1	C1	N	A1	A1	A1	A1	A1
Boric Acid	D2	A1	A1	D1	D1	D1	B2	A2	C1	A1	B1	A1	C1	A1	A1	A1	A1	A1	A1
Bromine, Wet Gas	N	A1	N	T	N	N	T	N	N	B3	D3	D3	N	N	N	N	N	C1	A1
Bromine, Dry Gas	N	A1	N	T	N	N	T	N	N	B3	D3	B3	N	N	N	N	N	C1	A1
Bromine Water - 5%	T	A1	N	D1	N	D1	T	N	N	D1	D1	D1	N	N	D1	D1	N	A1	A1
Butanol	D2	A1	A1	D1	C1	N	D2	A2	T	D1	D1	D1	C1	A1	D1	D1	D1	A1	A1
Butyl Acetate	N	A1	A1	D1	T	N	T	D2	N	D1	D1	D1	T	D1	N	N	N	D1	A1

KEY TO CHEMICAL RESISTANCE CHART

Rating	Meaning
A	Good to Maximum Temperature of Product
B	Good to 160°F (71°C) Maximum
C	Good to 140°F (60°C)
D	Good to 100°F (37°C) Ambient

Rating	Meaning
1	Immersion or Constant Flow
2	Intermittent or Spillage Only
3	Fumes Only
N	Not Recommended

Rating	Meaning
T	Varies With Conditions. May Require Test. Consult Ceilcote for Recommendation

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CEILCOTE

Corrosive Environment Tables

	LININGS				COATINGS					FLOOR TOPPINGS						
	Flakeline 100 Series	Lining Series	Ceilcrete Series	Coroline Series	Flakeline 200 Series	Flakeline 222HT	Flakeline 300	Flakeline 600	Flaketar	Ceilcrete Series	Coroline Series	681, 685 Floors	682, 683 Floors	687 Floors	Corocrete SR	Sealants
Butyl Acrylate	T	T	T	N	T	T	N	N	N	D2	D2	N	T	T	N	N
Butyl Amine	T	T	T	D3	D3	D3	N	N	N	D2	N	N	N	T	T	N
Butyl Carbitol	D1	D1	D1	D1	D1	D1	T	N	T	D2	A2	D2	D2	D2	N	D2
Butyl Carbitol Acetate	D1	D1	D1	D1	D1	D1	T	N	N	D2	D2	T	T	D2	N	N
Butyl Cellosolve	C1	C1	C1	D1	D1	D1	D2	N	N	D2	D2	T	D2	D2	N	N
Butyl Cellosolve Acetate	D1	D1	D1	D1	D1	D1	D2	T	N	D2	D2	T	D2	D2	N	N
Butyl Ether	D1	D1	D1	T	D1	D1	D2	T	N	D2	D2	T	D2	D2	N	N
Butyl Levuline Acid	D1	D1	D1	D1	D1	D1	T	T	N	D2	D2	T	D2	D2	D2	T
Butyric Acid 100%	D1	D1	D1	N	D1	D1	T	N	N	D2	T	N	N	D2	N	N
Cadmium Plating - Cyanide	C1	C1	C1	A1	D1	D1	T	C2	C2	A2	A2	C2	A2	A2	D2	D2
Calcium Bisulfite	A1	A1	A1	C1	D1	C1	C2	D1	D1	A2	A2	A2	D2	B2	D2	A2
Calcium Chloride	C1	A1	A1	A1	D1	C1	C2	D1	D1	A2	A2	A2	A2	A2	C2	A2
Calcium Hydroxide*	N	C1	C1	A1	D1	T	N	C2	D2	A2	A2	C2	A2	A2	C2	A2
Calcium Hypochlorite* - 5%	N	D1	D1	N	D2	T	N	N	N	N	T	N	D2	N	N	N
Calcium Nitrate	A1	A1	A1	C1	D1	C1	D1	D1	D1	A2	A2	A2	A2	A2	C2	A2
Caprylic Acid (Octanoic Acid)	C1	C1	C1	N	D1	D1	C2	N	N	D2	N	N	N	T	N	N
Carbolic Acid (Phenol) - 88%	N	N	N	N	N	N	N	N	N	D2	N	N	N	T	N	N
Carbon Bisulfide (Di)	D3	D3	N	N	D3	D3	N	N	N	D2	D2	N	D2	T	N	N
Carbon Tetrachloride	D1	C1	C1	D1	D1	D1	D2	N	N	A2	A2	D2	C2	C2	D2	D2
Castor Oil	B1	A1	C1	D1	C1	C1	D1	D1	D1	A2	A2	C2	A2	T	T	A2
Cellosolve	D1	D1	D1	D1	D1	D1	T	T	N	D2	D2	T	D2	D2	N	T
Cellosolve Acetate	D1	D1	D1	D1	D1	D1	T	N	N	D2	D2	N	D2	D2	N	N
Chloroacetic Acid 1-50%	D1	D1	D1	N	D1	D1	D3	N	N	D2	N	N	T	T	N	D2
Chloroacetic Acid - 50%	D1	D1	D1	N	D1	D1	D3	N	N	D2	N	N	N	D2	N	N
Chloroacetic Acid - 80%	N	N	N	N	N	N	N	N	N	D2	N	N	N	D2	N	N
Chlorine Dioxide - 15%	D1	C1	C1	N	D1	D1	T	N	N	B2	T	N	N	N	N	N
Chlorine Gas - Dry	C3	C3	C3	N	C3	C3	C3	N	N	N	N	N	N	N	N	N
Chlorine Gas - Wet	C3	C3	C3	N	D3	C3	N	N	N	D2	N	N	N	N	N	N
Chlorine Water - Saturated	C1	A1	C1	N	D1	C1	D3	N	N	B2	N	N	N	N	N	N
Chlorobenzene (Mono)	D1	D1	D1	D1	D1	D1	N	D2	D2	D2	D2	N	D2	D2	N	N
Chlorobutane	D1	D1	D1	D1	D1	D1	D2	T	N	D2	D2	T	T	D2	N	T
Chloroform	N	N	N	N	N	N	N	N	N	D2	T	N	N	N	N	N
Chlorophenol	N	T	T	T	T	T	N	N	N	D2	N	N	N	N	N	N
Chlorosulfonic Acid	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N
Chlorotoluene	D1	D1	D1	D1	D1	D1	T	D2	D2	D2	D2	N	D2	D2	N	N
Chromic Acid - 10%	C1	A1	C1	N	D1	D1	C2	N	N	C2	N	N	N	D2	N	D2
Chrome Plating 20 - 42 oz/gal	N	C1	N	N	C2	N	C3	N	N	C2	N	N	N	D2	N	N
Chromic Chloride	C1	A1	A1	N	D1	C1	C2	N	N	A2	A2	C2	A2	A2	D2	A2
Citric Acid	B1	A1	A1	D1	D1	C1	D1	D1	D1	A2	A2	C2	A2	A2	D2	D2
Copper Plating - Cyanide	D1	D1	D1	B1	D1	D1	N	D2	D2	A2	A2	C2	B2	A2	D2	D2
Copper Plating - Acid	B1	A1	A1	C1	D1	D1	C2	D2	D2	A2	B2	D2	D2	B2	D2	D2
Corn Oil	A1	A1	A1	D1	D1	C1	D1	D1	D1	A2	C2	D2	D2	B2	D2	D2
Cottonseed Oil	A1	A1	A1	D1	D1	C1	D1	D1	D1	A2	C2	D2	D2	B2	D2	D2
Cresol	N	T	D2	N	T	T	N	N	N	D2	N	N	N	T	N	N
Cresylic Acid	N	T	T	N	T	T	N	N	N	D2	N	N	N	T	N	N
Cumene	D1	D1	D1	D1	D1	D1	D2	N	N	D2	D2	T	T	D2	T	T
Cyclohexane	C1	C1	C1	C1	D1	D1	D2	N	N	C2	C2	D2	D2	D2	D2	D2
Cyclohexanone	D1	D1	D1	D1	D1	D1	D2	N	N	D2	D2	T	D2	D2	N	T
Cymene	D1	D1	D1	D1	D1	D1	D2	N	N	D2	D2	T	D2	D2	D2	T
Dextrose	A1	A1	A1	A1	D1	C1	D1	D1	D1	A2	A2	A2	A2	A2	C2	A2
Dibromopropane Phosphate	D1	D1	D1	D1	D1	D1	D2	D2	D2	D2	D2	D2	D2	D2	D2	D2
Dibutyl Phthalate	B1	C1	C1	B1	D1	C1	C2	D2	D2	C2	B2	D2	A2	B2	D2	A2
Dichloro Acetic Acid - 20%	D1	D1	D1	N	D1	D1	D3	N	N	D2	N	N	N	T	N	D2
Diethylamine - 100%	T	T	T	N	T	T	N	N	N	T	N	N	N	T	N	N
Diethylene Chloroformate	T	T	T	T	N	T	N	N	N	D2	D2	N	T	T	N	T
Diethylketone - 100%	D1	D1	D1	T	D1	D1	N	N	N	D2	T	N	D2	D2	N	N
Dimethyaminopropylamine	N	N	N	N	D3	T	N	N	N	D2	T	N	N	T	N	N
Dimethyl Aniline	D1	D1	D1	T	D1	T	T	N	N	D2	T	T	T	T	T	N

* Duracor requires synthetic veil for fluorides, caustics and hypochlorites. Other products may require carbon filler

UNIT OF GENERAL SIGNAL GS

CEILCOTE

Corrosive Environment Tables

	MORTARS MEMBRANES						GROUTS		DURACOR* FRP LAMINATES						DURACOR THERMOPLASTIC LAMINATES				
	Bric Bond (Reg.) & Carbon	Compobond	Corobond	Polyester	Epoxy	Ceilcote 8303, 8305, HM 195	640 Grout	Epoxy Grouts	Isophthalic Polyester	Bisphenol Polyester	Chlorinated Polyester	Vinyl Ester	Epoxy	Furan	Polyvinyl Chloride (PVC)	Polyvinyl Dichloride (CPVC)	Polypropylene (PP)	Kynar (PVDF)	Armalon (Teflon)
Butyl Acrylate	N	A1	A1	D2	D2	N	T	T	N	N	N	T	N	C1	N	N	N	A1	A1
Butyl Amine	N	N	A1	N	N	N	T	N	N	N	N	D3	N	C1	N	N	D1	D1	A1
Butyl Carbitol	N	A1	A1	D1	D1	N	D2	D2	N	D1	D1	D1	D1	A1	N	N	D1	B1	A1
Butyl Carbitol Acetate	N	A1	A1	D1	D1	N	D2	D2	T	D1	D1	D1	D1	A1	N	N	D1	D1	A1
Butyl Cellosolve	N	A1	A1	D2	D2	N	D1	D1	T	D1	D1	D1	D1	A1	N	N	D1	D1	A1
Butyl Cellosolve Acetate	N	A1	A1	D1	D1	N	D2	D2	T	D1	D1	D1	D1	A1	N	N	D1	D1	A1
Butyl Ether	N	A1	A1	D2	D2	N	D2	D2	D1	D1	D1	D1	T	A1	N	N	D1	C1	A1
Butyl Levuline Acid	N	A1	A1	D1	D1	N	D2	D2	T	D1	T	D1	D1	A1	T	T	D1	C1	A1
Butyric Acid 100%	D2	A1	A1	D1	N	N	D2	N	N	D1	D1	D1	N	A1	D1	D1	D1	A1	A1
Cadmium Plating - Cyanide	N	N	A1	C1	A1	A1	A2	A2	T	C1	C3	C1	A1	A1	A1	A1	A1	A1	A1
Calcium Bisulfite	C2	A1	A1	B1	C1	A1	B2	A2	D1	A1	B1	A1	D1	A1	A1	A1	A1	A1	A1
Calcium Chloride	A1	A2	A1	A1	A1	A1	A2	A2	A1	A1	A1	A1	A1	A1	A1	A1	A1	A1	A1
Calcium Hydroxide*	N	N	A1	D1	A1	A1	A2	A2	N	C1	N	N	A1	A1	A1	A1	A1	A1	A1
Calcium Hypochlorite* - 5%	N	N	N	D1	N	N	N	N	N	D3	N	D1	N	N	A1	A1	D1	A1	A1
Calcium Nitrate	A1	A2	A1	A1	A1	A1	A2	A2	B1	A1	A1	A1	B1	D1	A1	A1	A1	A1	A1
Caprylic Acid (Octanoic Acid)	N	A1	A1	C1	N	N	T	N	N	C1	C1	A1	N	A1	A1	A1	B1	A1	A1
Carbolic Acid (Phenol) - 88%	N	A1	A1	N	N	N	T	N	N	N	N	N	N	A1	N	A1	D1	B1	A1
Carbon Bisulfide (Di)	N	A1	A1	D2	D2	N	T	D2	N	D3	D3	D3	D3	A1	N	N	N	D1	A1
Carbon Tetrachloride	D2	A1	A1	C1	C1	N	C2	A2	C3	D1	N	D1	C1	A1	N	N	N	A1	A1
Castor Oil	N	A1	A1	A1	C1	N	T	C2	C1	C1	C1	C1	D1	A1	D1	D1	A1	A1	A1
Cellosolve	N	A1	A1	D1	D1	N	D2	D2	T	D1	D1	D1	D1	A1	N	N	D1	C1	A1
Cellosolve Acetate	N	A1	A1	D1	D1	N	D2	D2	T	D1	D1	D1	D1	A1	N	N	D1	C1	A1
Chloroacetic Acid 1 - 50%	N	A1	A1	D2	N	D1	T	D2	N	C1	N	D1	N	N	D1	D1	N	A1	A1
Chloroacetic Acid - 50%	N	A1	A1	D1	N	T	D2	N	N	D1	D1	D1	N	D1	D1	D1	N	B1	A1
Chloroacetic Acid - 80%	N	A1	A1	N	N	T	D2	N	N	D3	D3	D3	N	D1	D1	D1	N	B1	A1
Chlorine Dioxide - 15%	N	A1	N	C1	N	D1	N	N	N	C1	D1	B1	N	N	D1	D1	N	A1	A1
Chlorine Gas - Dry	D3	A1	N	C3	N	N	N	N	B3	B3	B3	A3	N	N	D1	D1	N	A1	A1
Chlorine Gas - Wet	N	A1	N	C3	N	N	N	N	D3	B3	B3	A3	N	N	N	N	N	A1	A1
Chlorine Water - Saturated	N	A1	N	C1	N	D1	N	N	D1	B1	B1	A1	N	N	D1	D1	N	A1	A1
Chlorobenzene (Mono)	N	A1	A1	D1	D1	N	D2	D2	N	D1	N	D1	D1	A1	N	N	N	B1	B1
Chlorobutane	N	A1	A1	D1	D1	N	D2	D2	D1	D1	D1	D1	D1	D1	N	N	N	D1	A1
Chloroform	D2	A1	A1	N	N	N	N	N	N	N	N	N	N	D1	N	N	N	D1	C1
Chlorophenol	N	A1	A1	N	N	N	N	N	N	N	N	T	N	B1	N	N	N	A1	A1
Chlorosulfonic Acid	N	A1	N	N	N	N	N	N	N	N	N	N	N	N	D1	D1	N	N	A1
Chlorotoluene	N	A1	A1	D1	D1	N	D2	D2	N	D1	N	C1	D1	B1	N	N	N	B1	A1
Chromic Acid - 10%	N	A1	D2	D1	N	D1	D2	T	N	N	C1	D1	N	N	A1	A1	D1	A1	A1
Chrome Plating 20 - 42 oz/gal	N	C1	N	N	N	N	D2	N	N	N	C1	C1	N	N	A1	A1	N	A1	A1
Chromic Chloride	C2	A1	A2	A1	C2	A1	A2	A2	C1	B1	A1	A1	N	A1	A1	A1	D1	A1	A1
Citric Acid	D1	A1	A1	A1	N	A1	A2	A2	C1	A1	A1	A1	C1	A1	A1	A1	A1	A1	A1
Copper Plating - Cyanide	N	N	A1	D1	B1	A1	A2	A2	N	N	C3	B1	A1	A1	A1	A1	A1	A1	A1
Copper Plating - Acid	C2	A2	A1	A1	C1	A1	B2	C2	C1	A1	A1	A1	D1	A1	A1	A1	A1	A1	A1
Corn Oil	N	A1	A1	A1	D1	N	B2	D2	B1	A1	A1	A1	D1	A1	A1	A1	A1	A1	A1
Cottonseed Oil	N	A1	A1	A1	D1	N	B2	D2	B1	A1	A1	A1	D1	A1	A1	A1	A1	A1	A1
Cresol	N	A1	A1	N	A1	N	T	N	N	N	N	N	N	D1	N	N	N	C1	A1
Cresylic Acid	N	A1	A1	N	N	N	T	N	N	N	N	C3	N	D1	N	N	N	C1	A1
Cumene	N	A1	A1	D1	D1	N	D2	D2	D1	D1	D1	D1	D1	A1	N	N	D1	B1	A1
Cyclohexane	D2	A1	A1	C1	C1	N	D2	D2	C1	C1	C1	C1	C1	A1	N	N	D1	A1	A1
Cyclohexanone	N	A1	A1	D1	D1	N	D2	D2	D1	D1	D1	D1	D1	A1	N	N	D1	A1	A1
Cymene	N	A1	A1	D1	D1	N	D2	D2	D1	D1	D1	D1	D1	A1	N	N	D2	D1	A1
Dextrose	B1	A1	A1	A1	A1	A1	A2	A2	B1	A1	B1	A1	C1	A1	A1	A1	A1	A1	A1
Dibromopropane Phosphate	D2	A1	A1	D1	D1	T	D2	D2	D1	D1	D1	D1	D1	A1	T	T	T	T	T
Dibutyl Phthalate	N	A1	A1	A1	B1	N	B2	A2	B1	A1	B1	A1	C1	A1	N	N	D1	A1	A1
Dichloro Acetic Acid - 20%	N	A1	A1	D1	N	D1	T	D2	N	D1	D1	D1	N	D1	D1	D1	D1	B1	A1
Diethylamine - 100%	N	T	T	N	N	N	T	N	N	N	N	N	N	B1	D1	D1	N	A1	A1
Diethylene Chloroformate	T	A1	A1	D2	D2	N	D2	T	T	T	N	T	T	D1	N	N	N	D1	A1
Diethylketone - 100%	N	A1	A1	D1	N	N	D2	D2	N	T	N	D1	T	D1	N	N	N	B1	D1
Dimethyaminopropylamine	N	A1	A1	N	N	N	T	N	N	N	D3	D3	N	D1	N	N	D1	D1	A1
Dimethyl Aniline	N	A1	A1	D1	D2	N	T	T	T	D1	D1	T	N	C1	N	N	D1	D1	A1

KEY TO CHEMICAL RESISTANCE CHART

Rating	Meaning
A	Good to Maximum Temperature of Product
B	Good to 160°F (71°C) Maximum
C	Good to 140°F (60°C)
D	Good to 100°F (37°C) Ambient

Rating	Meaning
1	Immersion or Constant Flow
2	Intermittent or Spillage Only
3	Fumes Only
N	Not Recommended

Rating	Meaning
T	Varies With Conditions. May Require Test. Consult Ceilcote for Recommendation

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CEILCOTE

Corrosive Environment Tables

	LININGS				COATINGS					FLOOR TOPPINGS						
	Flakeline 100 Series	Lining Series	Ceilcrete Series	Coroline Series	Flakeline 200 Series	Flakeline 222HT	Flakeline 300	Flakeline 600	Flaketar	Ceilcrete Series	Coroline Series	681, 685 Floors	682, 683 Floors	687 Floors	Corocrete SR	Sealants
Dimethyl Carbamoyl Chloride	D1	D1	D1	D1	D1	T	T	N	N	D2	D2	T	D2	D2	T	T
Dimethyl Carbonyl Chloride	T	T	T	D1	T	T	N	N	N	T	D2	T	T	T	N	N
Dimethyl Formamide	T	T	T	T	T	T	N	N	N	T	T	N	T	D2	N	N
Dimethyl Sulfoxide	T	T	T	T	T	T	N	N	N	D2	T	N	T	T	N	N
Dinitro Benzene	T	T	T	T	T	T	T	N	N	D2	D2	T	T	D2	T	N
Dinitro Butyl Phenol	C1	C1	C1	T	D1	D1	T	T	N	D2	D2	T	T	D2	T	T
Dinitro Toluene	T	T	T	T	T	T	T	N	N	D2	D2	T	D2	D2	T	N
Dodecyl Alcohol (Lauryl)	A1	A1	A1	D1	D1	C1	D2	T	T	A2	A2	D2	D2	D2	D2	T
Ethoxy Ethanol	D1	D1	D1	D1	D1	D1	T	T	N	D2	D2	D2	D2	D2	D2	T
Ethoxylated Nonyl Phenol	D1	D1	D1	C1	D1	T	T	T	N	D2	C2	T	T	D2	T	T
Ethyl Acetate	T	T	T	T	T	T	N	N	N	T	T	T	D2	D2	N	N
Ethyl Acrylate	T	T	T	D1	T	T	N	N	N	T	D2	N	T	T	N	N
Ethyl Alcohol	C1	C1	C1	C1	D1	D1	C2	D2	D2	C1	C1	D2	A2	C2	D2	A2
Ethylamine	T	T	T	N	T	T	N	N	N	T	N	N	N	T	N	N
Ethyl Bromide	T	T	T	T	T	T	T	N	N	T	T	N	T	T	N	N
Ethyl Chloride	D1	D1	D1	T	D1	D1	T	N	N	D2	T	N	T	T	N	N
Ethyl Chloroformate	T	T	T	T	T	T	T	N	N	D2	T	N	D2	D2	D2	D2
Ethyl Ether	N	N	N	T	N	N	N	N	N	N	T	N.	D2	D2	D2	T
Ethyl Hexyl Acrylate	T	T	T	T	T	T	N	N	N	D2	D2	N	T	T	N	N
Ethylene Dichloride	T	T	N	D1	D2	D2	N	N	N	N	D1	N	N	N	N	N
Ethylene Glycol	A1	A1	A1	A1	C1	B1	D1	D1	D1	A2	A2	A2	A2	B2	C2	A2
Ethylene Oxide	T	T	T	N	T	T	N	N	N	T	N	N	D2	T	N	N
Ethyl Sulfate	D1	D1	D1	D1	D1	D1	T	N	N	D2	D2	N	D2	T	N	N
Ferric Chloride	A1	A1	A1	A1	D1	C1	D1	D1	D1	A2	A2	D2	A2	B2	D2	A2
Ferric Sulfate	A1	A1	A1	A1	D1	C1	D1	D1	D1	A2	A1	C2	A2	B2	D2	A2
Fluosilicic Acid* - 25%	N	C1	C1	T	D2	D2	T	T	T	D2	D2	D2	D2	D2	D2	D2
Formaldehyde	D1	D1	D1	D1	D1	D1	D1	D2	D2	A2	A2	D2	A2	C2	D2	A2
Formic Acid	D1	D1	D1	N	D1	C1	D3	N	N	D2	N	N	N	D2	N	N
Furfural	D1	D1	D1	T	D1	C1	D3	N	N	D2	T	N	T	T	N	T
Furfuryl Alcohol	D1	D1	D1	D1	D1	D1	D2	N	N	D2	C2	D2	D2	D2	D2	D2
Gasoline	A1	A1	A1	A1	D1	C1	D1	D1	D1	A2	A2	D2	A2	C2	D2	D1
Glucose	A1	A1	A1	A1	D1	C1	D1	D1	D1	A2	A2	A2	A2	A2	C2	A1
Glycerine	A1	A1	A1	A1	D1	C1	D1	D1	D1	A2	A2	A2	A2	A2	C2	A1
Glycolic Acid	D1	D1	D1	T	D1	D1	D2	N	N	D2	D2	D2	T	C2	D2	N
Gold Plating (Cyanide)	D1	D1	C1	A1	D1	C1	N	C2	D2	C2	A2	D2	A2	A2	C2	D2
Grape Juice	A1	A1	A1	A1	D1	C1	D1	D1	D1	A2	A2	A2	A2	A2	C2	A2
Green Liquor (Paper Ind)	B1	B1	C1	A1	D1	C1	D2	D2	D2	C2	A2	C2	A2	A2	C2	A2
Heptane	C1	C1	C1	C1	D1	D1	D1	D2	N	C2	A2	C2	A2	C2	D2	D2
Hexane	C1	C1	C1	C1	D1	D1	D1	D2	N	C2	A2	D2	A2	C2	D2	D2
Hydrazine - 35%	T	T	T	D1	T	T	T	N	N	T	D2	T	D2	D2	T	D2
Hydrazine Hydrate	T	T	T	D1	T	T	N	N	N	T	D2	N	T	D2	N	T
Hydriodic Acid - 20%	C1	C1	C1	T	D1	C1	D2	N	N	C2	T	N	T	D2	N	T
Hydrobromic Acid - 20%	B1	B1	B1	T	D1	C1	D2	N	N	C2	T	N	T	D2	N	T
Hydrobromic Acid - 48%	C1	C1	C1	N	D1	D1	T	N	N	D2	N	N	N	T	N	T
Hydrochloric Acid 1-15%	A1	A1	A1	D1	D1	C1	D1	D1	D1	C2	C2	D2	C2	B2	N	D2
Hydrochloric Acid 16-25%	C1	C1	C1	N	D1	D1	D2	N	N	C2	D2	D2	D2	B2	N	N
Hydrochloric Acid 26-34%	D1	D1	D1	N	D2	D2	D3	N	N	D2	N	N	D2	C2	N	N
Hydrochloric Acid Conc.	N	D1	N	N	D2	D2	D3	N	N	D2	D2	N	D2	D2	N	N
Hydrofluoric Acid* 1-10%	N	D1	D1	D1	T	T	D2	D3	D3	D2	D2	D2	D2	D2	N	D2
Hydrofluoric Acid* 11-20%	N	N	D1	N	N	N	N	N	N	D2	T	N	N	N	N	N
Hydrofluoric Acid* 21-48%	N	N	D1	N	N	N	N	N	N	D2	T	N	N	N	N	N
Hydrofluosilicic Acid - 25%	N	C1	C1	T	D2	D2	T	T	T	D2	D2	D2	D2	D2	D2	D2
Hydrogen Peroxide - 30%	C1	C1	C1	T	D1	C1	D2	T	T	D2	D2	D2	D2	D2	N	T
Hydrogen Sulfide Gas	A3	A3	A3	D3	D3	C3	C3	D3	D2	T	T	T	T	T	T	D3
Hypo (Photographic Solution)	A1	A1	A1	A1	D1	C1	C2	T	T	A2	A2	A2	A2	A2	D2	A2
Hypochlorous Acid	N	T	N	N	N	N	N	N	N	N	N	N	N	N	N	N
Iodine, Crystals	C1	C1	C1	T	D1	D1	D3	T	T	C2	T	T	T	T	D2	D2
Isooctylthioglycolate	D1	D1	D1	T	D1	D1	T	T	T	D2	T	T	T	T	T	T

* Duracor requires synthetic veil for fluorides, caustics and hypochlorites. Other products may require carbon filler.

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CEILCOTE

Corrosive Environment Tables

	MORTARS MEMBRANES							GROUTS			DURACOR® FRP LAMINATES							THERMOPLASTIC LAMINATE				
	Bric Bond (Reg.) & Carbon	Compobond	Corobond	Polyester	Epoxy	Ceilcote 8303, 8305, HM 195		640 Grout	Epoxy Grouts		Isophthalic Polyester	Bisphenol Polyester	Chlorinated Polyester	Vinyl Ester	Epoxy	Furan		Polyvinyl Chloride (PVC)	Polyvinyl Dichloride (CPVC)	Polypropylene (PP)	Kynar (PVDF)	Armalon (Teflon)
Dimethyl Carbamoyl Chloride	T	A1	A1	D1	D1	T		D2	D2		N	D1	N	T	D1	B1		N	N	T	T	A1
Dimethyl Carbonyl Chloride	N	A1	A1	T	D1	N		D2	D2		N	N	N	T	D1	D1		N	N	T	T	A1
Dimethyl Formamide	N	A1	A1	N	N	N		D2	D2		N	D1	N	T	N	D1		N	N	D1	N	N
Dimethyl Sulfoxide	N	A1	A1	N	T	N		T	T		N	T	N	T	T	B1		N	N	D1	D1	A1
Dinitro Benzene	N	A1	B1	D2	T	N		T	T		N	T	N	T	T	B1		N	N	D1	D1	A1
Dinitro Butyl Phenol	T	A1	A1	C1	T	N		C2	D2		T	C1	T	C1	T	B1		N	N	D1	A1	A1
Dinitro Toluene	N	A1	T	T	D1	N		D2	D2		N	D3	N	D3	T	B1		N	N	T	A1	A1
Dodecyl Alcohol (Lauryl)	D2	A1	A1	C1	D1	T		D2	D2		D1	D1	D1	B1	D1	A1		D1	D1	D1	A1	A1
Ethoxy Ethanol	D2	A1	A1	D1	D1	T		D2	D2		T	D1	T	D1	D1	D1		N	N	T	T	A1
Ethoxylated Nonyl Phenol	T	A1	A1	D1	C1	N		D2	D2		T	D1	D1	T	D1	A1		N	N	T	T	A1
Ethyl Acetate	N	A1	A1	N	D2	N		D2	D2		N	N	N	T	T	D1		N	N	N	N	N
Ethyl Acrylate	N	A1	B1	N	D1	N		T	T		N	T	T	T	D1	B1		N	N	T	T	A1
Ethyl Alcohol	C1	A1	A1	C1	C1	D1		C2	A2		D1	D1	D1	D1	C1	A1		D1	D1	D1	A1	A1
Ethylamine	N	T	T	N	N	N		T	N		N	T	N	T	N	A1		D2	D2	D2	N	A1
Ethyl Bromide	N	A1	N	T	T	N		T	T		N	T	N	N	N	N		N	N	N	D1	A1
Ethyl Chloride	N	A1	D1	T	T	N		T	T		N	T	N	T	T	N		N	N	N	D1	A1
Ethyl Chloroformate	T	A1	A1	D2	T	N		D2	D2		N	T	T	T	T	D1		N	N	N	D1	A1
Ethyl Ether	N	A1	A1	D2	T	N		D2	D2		N	D3	N	D3	T	D1		N	N	N	D1	A1
Ethyl Hexyl Acrylate	N	A1	B1	N	T	N		T	T		N	T	N	T	T	D1		N	N	N	D1	A1
Ethylene Dichloride	N	A1	A1	N	D1	N		N	D2		N	T	N	D3	T	A1		N	N	N	D1	A1
Ethylene Glycol	N	A1	A1	A1	A1	D1		B2	A2		B1	A1	B1	A1	C1	A1		A1	A1	A1	A1	A1
Ethylene Oxide	T	A1	A1	T	N	N		T	N		N	T	N	N	N	D1		N	N	N	D1	A1
Ethyl Sulfate	T	A1	A1	D1	D1	N		T	D2		N	D1	D1	D1	D1	D1		N	N	N	N	A1
Ferric Chloride	C1	A2	A1	A1	A1	A1		B2	A2		A1	A1	A1	A1	C1	A1		A1	A1	A1	A1	A1
Ferric Sulfate	C1	A2	A1	A1	A1	A1		B2	A2		A1	A1	A1	A1	C1	A1		A1	A1	A1	A1	A1
Fluosilicic Acid* - 25%	A1	N	A1	C1	T	D1		D2	D2		D1	B1	B1	B1	T	A1		A1	A1	A1	A1	A1
Formaldehyde	C1	A1	A1	D1	D1	A1		C2	A2		C1	D1	C1	C1	C1	A1		D1	D1	A1	A1	A1
Formic Acid	D2	A1	A1	D1	N	N		D2	N		T	D1	D1	D1	N	N		D1	D1	C1	A1	A1
Furfural	N	A1	A1	D1	T	N		T	T		N	D1	D1	N	T	N		N	N	N	N	A1
Furfuryl Alcohol	N	A1	A1	D1	D1	N		D2	D2		N	D1	D1	D1	D1	D1		N	N	N	D1	A1
Gasoline	D2	A1	A1	A1	B1	N		A2	A2		A1	A1	A1	A1	C1	A1		N	N	D1	A1	A1
Glucose	B1	A1	A1	A1	A1	A1		A2	A2		A1	A1	A1	A1	C1	A1		A1	A1	A1	A1	A1
Glycerine	B1	A1	A1	A1	A1	A1		A2	A2		A1	A1	A1	A1	C1	A1		A1	A1	A1	A1	A1
Glycolic Acid	T	A1	A1	D1	N	D1		C2	N		D1	C1	C1	C1	N	A1		D1	D1	D1	D1	A1
Gold Plating (Cyanide)	D2	N	A1	C1	A1	A1		A2	A2		D3	C1	D3	C1	A1	A1		A1	A1	A1	A1	A1
Grape Juice	D1	A1	A1	A1	A1	A1		A2	A2		A1	A1	A1	A1	A1	A1		A1	A1	A1	A1	A1
Green Liquor (Paper Ind)	D3	N	A1	C1	A1	A1		A2	A2		N	C1	N	C1	A1	D2		A1	A1	D1	A1	A1
Heptane	N	A1	A1	C1	A1	N		C2	A2		A1	A1	D1	A1	C1	A1		N	N	N	A1	A1
Hexane	N	A1	A1	C1	A1	N		C2	A2		D1	C1	D1	C1	C1	A1		N	N	D1	A1	A1
Hydrazine - 35%	T	A1	T	T	D1	T		D2	D2		N	T	T	T	D1	N		N	N	N	A1	A1
Hydrazine Hydrate	N	N	N	T	D1	N		D2	D2		N	N	N	N	D1	D1		D1	D1	T	A1	A1
Hydriodic Acid - 20%	D2	A1	N	D1	T	D2		D2	T		D3	D1	B3	C1	N	A1		A1	A1	D1	A1	A1
Hydrobromic Acid - 20%	C1	A1	D1	D1	T	D2		D2	T		C1	B1	B1	B1	N	D1		A1	A1	A1	A1	A1
Hydrobromic Acid - 48%	C1	A1	D1	C1	N	T		T	N		D3	D1	D1	C1	N	D1		D1	D1	D1	A1	A1
Hydrochloric Acid 1-15%	A1	A1	A1	A1	D1	D1		B2	D2		C1	A1	A1	A1	D1	A1		A1	A1	A1	A1	A1
Hydrochloric Acid 16-25%	A1	A1	A1	C1	N	D1		B2	D2		D1	B1	B1	B1	N	D1		C1	C1	D1	A1	A1
Hydrochloric Acid 26-34%	D1	A1	A1	D1	N	N		C2	D2		D1	B1	B1	B1	N	D1		D1	D1	D1	A1	A1
Hydrochloric Acid Conc.	D1	A1	D1	D1	N	N		D2	D2		D1	D1	C1	C1	N	N		D1	D1	D1	A1	A1
Hydrofluoric Acid* 1-10%	A1	N	A1	D1	D2	D1		D2	D2		D1	D1	D1	C1	T	D1		C1	C1	A1	A1	A1
Hydrofluoric Acid* 11-20%	D1	N	A1	D1	N	N		N	N		D1	D1	D1	D1	N	N		D1	D1	A1	A1	A1
Hydrofluoric Acid* 21-48%	C1	N	A1	D1	N	N		N	N		N	D1	D1	C1	N	N		D1	D1	D1	B1	A1
Hydrofluosilicic Acid - 25%	A1	N	A1	D1	T	D1		D2	D2		D1	B1	B1	B1	T	A1		A1	A1	A1	A1	A1
Hydrogen Peroxide - 30%	D2	A1	N	C1	T	T		D2	D2		T	D1	C1	C1	T	N		D1	D1	D1	D1	A1
Hydrogen Sulfide Gas	A3	A1	A1	A1	B3	A3		T	T		D3	A3	A3	A3	D3	D3		D3	D3	B3	D3	A3
Hypo (Photographic Solution)	A1	A1	A1	A1	A1	A1		A2	A2		D1	A1	A1	A1	A1	A1		A1	A1	A1	A1	A1
Hypochlorous Acid	N	A1	N	N	N	N		N	N		N	N	N	T	N	N		D1	D1	N	B1	A1
Iodine, Crystals	D2	A1	N	C1	T	D2		D2	D2		D1	C1	C1	C1	N	N		N	N	D1	A1	A1
Isooctylthioglycolate	T	A1	A1	D1	T	N		T	T		D1	D1	D1	D1	T	D1		T	T	T	A1	A1

KEY TO CHEMICAL RESISTANCE CHART

Rating	Meaning
A	Good to Maximum Temperature of Product
B	Good to 160°F (71°C) Maximum
C	Good to 140°F (60°C)
D	Good to 100°F (37°C) Ambient

Rating	Meaning
1	Immersion or Constant Flow
2	Intermittent or Spillage Only
3	Fumes Only
N	Not Recommended

Rating	Meaning
T	Varies With Conditions. May Require Test. Consult Ceilcote for Recommendation

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CEILCOTE

Corrosive Environment Tables

	LININGS				COATINGS					FLOOR TOPPINGS						
	Flakeline 100 Series	Lining Series	Ceilcrete Series	Coroline Series	Flakeline 200 Series	Flakeline 222HT	Flakeline 300	Flakeline 600	Flaketar	Ceilcrete Series	Coroline Series	681, 685 Floors	682, 683 Floors	687 Floors	Corocrete SR	Sealants
Isophorone	D1	D1	D1	D1	D1	D1	T	T	T	D2	D2	D2	D2	D2	N	T
Isopropyl Acetate	T	T	T	T	T	T	T	N	N	D2	D2	N	D2	D2	N	N
Isopropyl Alcohol	C1	C1	C1	C1	D1	D1	D2	D2	D2	A2	A2	C2	A2	D2	D2	D2
Isopropyl Ether	D1	D1	D1	D1	D1	D1	T	N	N	D2	D2	D2	D2	D2	D2	D2
Jet Fuel	A1	A1	C1	A1	D1	D1	D1	D1	N	A2	A2	C2	A2	C2	D2	B2
Kerosene	A1	A1	A1	A1	B1	B1	D1	D1	N	A2	A2	C2	A2	C2	C2	B2
Ketchup	A1	A1	A1	A1	D1	C1	C2	C2	D2	A2	A2	A2	A2	B2	C2	A2
Lactic Acid 1-20%	B1	B1	C1	T	D1	C1	C2	N	N	D2	D2	N	D2	C2	N	D2
Lactic Acid Concentrated	D1	D1	D1	N	D1	C1	D1	N	N	D2	T	N	N	D2	N	T
Lard	A1	A1	A1	T	D1	D1	C2	N	N	A2	C2	D2	D2	B2	D2	D2
Lauric Acid	C1	C1	C1	T	D1	C1	C2	N	N	A2	D2	D2	T	D2	N	T
Lead Acetate	A1	A1	A1	A1	C1	C1	C2	D2	D2	A2	A2	A2	A2	A2	C2	A2
Lecithin	D1	D1	D1	D1	D1	D1	D1	D2	D2	D2	D2	D2	D2	D2	D2	D2
Levulinic Acid (Sat'd)	A1	A1	A1	D1	D1	C1	T	N	N	A2	D2	T	D2	D2	D2	D2
Linseed Oil	A1	A1	A1	D1	D1	C1	D1	D2	D2	A2	A2	D2	D2	D2	D2	D2
Lithium Hydroxide* - 10%	N	D1	D1	A1	D2	N	N	D1	D1	D2	B2	D2	B2	C2	B2	C2
Lithium Hydroxide* - 50%	N	D1	D1	A1	D2	N	N	D1	D1	D2	B2	D2	B2	B2	D2	C2
Maleic Acid	B1	B1	C1	N	D1	C1	D2	N	N	A2	N	N	N	B2	N	N
Malic Acid	C1	C1	C1	B1	D1	C1	T	T	N	A2	A2	D2	C2	C2	D2	D2
Mercury and Salts	A1	A1	A1	A1	D1	C1	D1	D1	D1	A2	A2	A2	A2	B2	C2	A2
Methanol	D1	D1	D1	D1	D1	D2	D2	D2	D2	A2	A2	D2	D2	D2	D2	D2
Methyl Acetate	T	T	T	T	T	T	T	N	N	D2	D2	D2	D2	D2	N	N
Methylamyl Alcohol	D1	D1	D1	D1	D1	D1	T	T	T	D2	D2	T	D2	D2	D2	T
Methylene Chloride	T	T	T	N	D2	D2	N	N	N	D2	T	N	N	N	N	N
Methyl Chloride	T	T	T	N	N	T	N	N	N	D2	T	N	N	N	N	N
Methyl Ethyl Ketone	T	T	T	T	T	T	N	N	N	D2	D2	T	D2	D2	N	N
Methyl Oleate	D1	D1	D1	D1	D1	D1	D1	T	N	D2	D2	T	D2	D2	T	T
Methyl Sulfate	T	T	T	T	T	T	N	N	N	D2	T	N	T	D2	N	N
Methyl Isobutyl Ketone	D1	D1	D1	D1	D1	D1	N	N	N	D2	D2	D2	D2	D2	N	N
Milk - Fresh & Sour	A1	A1	A1	A1	D1	C1	D1	D1	D1	A2	A2	A2	A2	B2	C2	A2
Molasses	A1	A1	A1	A1	D1	C1	D1	D1	D1	A2	A2	A2	A2	B2	C2	A2
Naphtha - Aliphatic	C1	C1	C1	C1	D1	C1	C2	D2	D2	A2	A2	D2	D2	D2	D2	D2
Naptha, Aromatic (Coal Tar)	D1	D1	D1	D1	D1	D1	T	N	N	D2	D2	D2	D2	D2	T	T
Naphthalene (In Benzene)	D1	D1	D1	D1	D1	D1	N	N	N	D2	D2	T	D2	D2	T	N
Naphthenic Acid	D1	D1	D1	D1	D1	D1	D2	N	N	D2	D2	D2	T	D2	D2	T
Nickel Plating, Bright	A1	A1	A1	C1	D1	C1	C2	C2	D2	A2	A2	A2	C2	C2	D2	A2
Nitric Acid - 5%	C1	B1	C1	N	D1	C1	D1	N	N	B2	D2	D2	D2	C2	N	N
Nitric Acid - 10%	C1	B1	C1	N	D1	C1	D2	N	N	C2	D2	D2	D2	C2	N	N
Nitric Acid - 25%	D1	D1	D1	N	D2	D2	D2	N	N	D2	N	N	N	C2	N	N
Nitric Acid - 40%	D1	D1	D1	N	D2	D2	N	N	N	D2	N	N	N	C2	N	N
Nitric Acid - 60%	D1	D1	D1	N	D2	D2	N	N	N	D2	N	N	N	D2	N	N
Nitric Acid - 73%	N	N	N	N	N	N	N	N	N	D2	N	N	N	N	N	N
Nitrilotriethanol	D1	D1	D1	D1	D1	D1	D2	T	T	D2	D2	D2	D2	D2	D2	T
Nitrobenzene	D1	D1	D1	T	D1	D1	N	N	N	D2	D2	N	T	D2	D2	N
Nitromethane	D1	D1	D1	T	D1	T	N	N	N	D2	D2	T	T	T	N	T
Octanoic Acid	C1	C1	C1	D1	D1	C1	T	T	T	C2	C2	N	T	C2	N	T
Octanol	D1	D1	D1	N	D1	T	T	T	T	D2	D2	T	D2	D2	T	T
Oils																
Sour Crude Petroleum	A1	A1	A1	A1	D1	C1	D1	D1	D1	A2	A2	C2	A2	A2	C2	A2
Animal	B1	A1	A1	T	C1	C1	D1	D2	D2	A2	D2	N	D2	B2	N	C2
Mineral	A1	A1	A1	A1	D1	C1	D1	D1	D1	A2	A2	A2	A2	A2	C2	A2
Vegetable	A1	A1	A1	T	D1	C1	D1	D2	D2	A2	C2	C2	C2	C2	D2	C2
Oleic Acid	B1	A1	A1	N	D1	C1	D1	N	N	A2	D2	N	T	C2	N	N
Oleum	See Sulfuric Acid															
Oxalic Acid (Sat'd)	A1	A1	C1	T	D1	C1	D1	D2	D2	A2	A2	A2	A2	A2	D2	A2
Para Xylene	C1	C1	C1	C1	C1	C1	T	N	N	C2	C2	T	D2	D2	N	N
Pelargonic Acid	D1	D1	D1	T	D1	D1	T	N	N	D2	D2	T	D2	T	N	D2
Pentachloroethane	D1	D1	D1	N	D1	D1	N	N	N	B2	D2	N	D2	D2	D2	N

* Duracor requires synthetic veil for fluorides, caustics and hypochlorites. Other products may require carbon filler.

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CEILCOTE

Corrosive Environment Tables

	MORTARS MEMBRANES						GROUTS		DURACOR* FRP LAMINATES						DURACOR THERMOPLASTIC LAMINATES				
	Bric Bond (Reg.) & Carbon	Compobond	Corobond	Polyester	Epoxy	Ceilcote 8303, 8305, HM 195	640 Grout	Epoxy Grouts	Isophthalic Polyester	Bisphenol Polyester	Chlorinated Polyester	Vinyl Ester	Epoxy	Furan	Polyvinyl Chloride (PVC)	Polyvinyl Dichloride (CPVC)	Polypropylene (PP)	Kynar (PVDF)	Armalon (Teflon)
Isophorone	N	A1	A1	D1	D1	N	D2	D2	D2	D1	D1	D1	D1	A1	N	N	D1	A1	A1
Isopropyl Acetate	N	A1	A1	D2	D2	N	D2	N	N	N	T	T	N	A1	N	N	D1	A1	A1
Isopropyl Alcohol	D2	A1	A1	D1	C1	D1	D2	A2	D1	D1	C1	D1	C1	A1	C1	C1	C1	A1	A1
Isopropyl Ether	T	A1	A1	D1	D1	N	D2	D2	D1	D1	T	D1	D1	D1	N	N	N	D1	A1
Jet Fuel	N	A1	A1	A1	A1	N	C2	B2	A1	A1	A1	A1	A1	A1	D1	D1	D1	A1	A1
Kerosene	N	A1	A1	A1	A1	N	C2	B2	A1	A1	A1	A1	A1	A1	D1	D1	D1	A1	A1
Ketchup	B2	A1	A1	A1	A1	A1	B2	A2	A1	A1	A1	A1	A1	A1	D1	B1	A1	A1	A1
Lactic Acid 1-20%	C1	A1	A1	C1	T	D1	C2	N	C1	A1	A1	A1	N	A1	D1	D1	A1	D1	A1
Lactic Acid Concentrated	D2	A1	A1	D1	N	N	D2	N	C1	A1	A1	A1	N	A1	D1	D1	D1	D1	A1
Lard	N	A1	A1	A1	T	N	B2	D2	A1	A1	A1	A1	T	A1	D1	D1	D1	A1	A1
Lauric Acid	N	A1	A1	C1	N	N	D2	C2	C1	A1	A1	A1	N	A1	D1	D1	D1	A1	A1
Lead Acetate	D1	A1	A1	A1	A1	A1	A2	A2	A1	A1	A1	A1	A1	A1	C1	B1	A1	A1	A1
Lecithin	D2	A1	A1	D1	D1	T	D2	D2	D1	D1	D1	D1	D1	A1	A1	A1	A1	A1	A1
Levulinic Acid (Sat'd)	N	A1	A1	B1	D1	T	D2	D2	D1	D1	D1	D1	D1	A1	D1	D1	D1	A1	A1
Linseed Oil	N	A1	A1	A1	D1	N	D2	D2	A1	A1	A1	A1	D1	A1	C1	B1	A1	A1	A1
Lithium Hydroxide* - 10%	N	N	C1	D1	A1	D1	C2	C2	N	D1	N	D1	B1	B1	D1	D1	D1	A1	A1
Lithium Hydroxide* - 50%	N	N	C1	D1	A1	D1	C2	C2	N	D1	N	D1	B1	B1	D1	D1	D1	A1	A1
Maleic Acid	C1	A1	A1	C1	N	N	C2	N	C1	A1	A1	A1	N	A1	D1	D1	D1	A1	A1
Malic Acid	N	A1	A1	C1	B1	T	C2	C2	D1	C1	D1	C1	D1	A1	C1	C1	A1	A1	A1
Mercury and Salts	A1	A1	A1	A1	A1	A1	B2	A2	A1	A1	A1	A1	A1	A1	A1	A1	A1	A1	A1
Methanol	D1	A1	A1	D1	D1	D1	D2	D2	D1	D1	D1	D3	D1	A1	C1	B1	B1	A1	A1
Methyl Acetate	D2	A1	A1	T	T	N	D2	T	N	N	N	T	T	C1	N	N	D1	C1	A1
Methylamyl Alcohol	C1	A1	A1	D1	D1	T	D2	D2	T	D1	D1	D1	D1	A1	T	T	T	D1	A1
Methylene Chloride	N	A1	D1	N	N	N	N	N	N	N	N	D3	N	D1	N	N	N	D1	A1
Methyl Chloride	N	A1	A1	N	N	N	N	N	N	N	N	N	N	D1	N	N	N	A1	A1
Methyl Ethyl Ketone	N	A1	D1	T	T	N	D2	D2	N	T	N	D3	D3	D1	N	N	N	N	C1
Methyl Oleate	N	A1	A1	D1	D1	N	D2	D2	D1	D1	D1	D1	D1	A1	T	T	T	D1	A1
Methyl Sulfate	T	A1	A1	N	T	N	D2	D2	N	T	T	T	T	D1	N	D1	D1	A1	A1
Methyl Isobutyl Ketone	D2	A1	A1	D	D1	N	D2	D2	N	T	N	D1	D1	D1	N	N	N	A1	A1
Milk - Fresh & Sour	A2	A1	A1	A1	A1	A1	B2	A2	A1	A1	A1	A1	A1	A1	B1	A1	A1	A1	A1
Molasses	A2	A1	A1	A1	A1	A1	B2	A2	A1	A1	A1	A1	A1	A1	B1	A1	A1	A1	A1
Naphtha - Aliphatic	D2	A1	A1	C1	A1	N	B2	D2	C1	A1	A1	A1	A1	A1	D1	D1	D1	A1	A1
Naptha, Aromatic (Coal Tar)	N	A1	A1	D1	D1	N	D2	D2	D1	D1	D1	D1	C1	B1	N	N	D1	A1	A1
Naphthalene (In Benzene)	N	A1	C1	D1	D1	N	D2	D2	N	D1	D1	D1	D1	B1	N	N	N	D1	A1
Naphthenic Acid	N	A1	A1	D1	D1	N	D2	D2	D1	C1	C1	C1	D1	A1	C1	B1	D1	A1	A1
Nickel Plating, Bright	A1	A1	A1	A1	C1	A1	C2	A2	C1	A1	A1	A1	D1	A1	C1	B1	A1	A1	A1
Nitric Acid - 5%	C1	A1	N	C1	N	A1	C2	N	C1	A1	A1	A1	N	N	C1	B1	A1	A1	A1
Nitric Acid - 10%	D1	A1	N	C1	N	D1	C2	N	D1	B1	B1	B1	N	N	C1	B1	A1	A1	A1
Nitric Acid - 25%	D1	A1	N	D1	N	N	C2	N	N	C1	C1	C1	N	N	D1	D1	D1	A1	A1
Nitric Acid - 40%	N	A1	N	D1	N	N	C2	N	N	D1	C1	D1	N	N	D1	D1	D1	B1	A1
Nitric Acid - 60%	N	A1	N	D1	N	N	D2	N	N	D1	D1	D1	N	N	D1	D1	N	D1	B1
Nitric Acid - 73%	N	A1	N	N	N	N	N	N	N	B3	B3	B3	N	N	N	N	N	N	D1
Nitrilotriethanol	T	A1	A1	D1	D1	N	D2	D2	T	D1	D1	D1	D1	D1	N	N	T	D1	A1
Nitrobenzene	N	A1	A1	D1	D1	N	D2	T	N	T	T	D1	T	D1	N	N	N	D1	A1
Nitromethane	N	A1	B1	D1	T	N	T	T	N	D1	N	N	T	A1	N	N	T	D1	A1
Octanoic Acid	N	A1	A1	C1	D1	N	D2	D2	T	C1	C1	A1	D1	A1	D1	D1	D1	A1	A1
Octanol	N	A1	A1	D1	N	T	D2	D2	T	D1	D1	D1	N	B1	D1	D1	D1	A1	A1
Oils																			
Sour Crude Petroleum	N	A1	A1	A1	A1	N	A2	A2	A1	A1	A1	A1	A1	A1	D1	D1	C1	A1	A1
Animal	N	A1	A1	A1	A1	N	B2	C2	A1	A1	A1	A1	T	A1	D1	D1	B1	A1	A1
Mineral	N	A1	A1	A1	A1	N	A2	A2	A1	A1	A1	A1	A1	A1	D1	D1	B1	A1	A1
Vegetable	N	A1	A1	A1	A1	N	C2	T	A1	A1	A1	A1	T	A1	D1	D1	B1	A1	A1
Oleic Acid	D1	A1	A1	A1	N	N	C2	N	A1	A1	A1	A1	N	D1	N	N	D1	A1	A1
Oleum															See Sulfuric Acid				
Oxalic Acid (Sat'd)	A1	A1	A1	C1	T	A1	A2	A2	A1	A1	A1	A1	T	A1	D1	D1	D1	D1	A1
Para Xylene	N	A1	B1	C1	C1	N	D2	D2	N	N	N	C1	D1	A1	N	N	N	B1	A1
Pelargonic Acid	T	A1	A1	D1	T	N	T	D2	D1	D1	D1	D1	T	A1	D1	A1	D1	D1	A1
Pentachloroethane	N	A1	A1	D1	N	N	D2	D2	T	T	T	B1	N	D1	N	N	N	D1	A1

KEY TO CHEMICAL RESISTANCE CHART

Rating	Meaning
A	Good to Maximum Temperature of Product
B	Good to 160°F (71°C) Maximum
C	Good to 140°F (60°C)
D	Good to 100°F (37°C) Ambient

Rating	Meaning
1	Immersion or Constant Flow
2	Intermittent or Spillage Only
3	Fumes Only
N	Not Recommended

Rating	Meaning
T	Varies With Conditions. May Require Test. Consult Ceilcote for Recommendation.

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CEILCOTE

Corrosive Environment Tables

	LININGS				COATINGS					FLOOR TOPPINGS						
	Flakeline 100 Series	Lining Series	Ceilcrete Series	Coroline Series	Flakeline 200 Series	Flakeline 222HT	Flakeline 300	Flakeline 600	Flaketar	Ceilcrete Series	Coroline Series	681, 685 Floors	682, 683 Floors	687 Floors	Corocrete SR	Sealants
Perchloric Acid - 30%	D1	D1	D1	N	D1	D1	N	N	N	D2	T	D2	T	T	T	N
Perchloroethylene	D1	D1	D1	D1	D1	D1	T	N	N	B2	C2	N	D2	D2	D2	D2
Phenol - 5%	D1	D1	D1	T	D1	D1	T	N	N	D2	D2	N	N	D2	N	D2
Phenol - 85%	T	T	T	N	T	T	N	N	N	D2	T	N	N	N	N	N
Phenol Sulfonic Acid - 65%	D1	D1	D1	N	D3	D3	T	N	N	D2	T	T	T	T	N	N
Phosphoric Acid - 20%	A1	A1	A1	N	D1	C1	C2	N	N	A2	D2	D2	D2	B2	N	D1
Phosphoric Acid - 85%	A1	A1	A1	N	D1	C1	D1	N	N	A2	N	N	N	C2	N	N
Phosphorous Oxychloride	N	N	N	C1	N	N	T	T	T	T	C2	T	D2	D2	N	T
Phosphorous Trichloride	N	N	N	C1	N	N	T	T	T	T	C2	T	D2	D2	N	N
Picric Acid - 10% in Alcohol	C1	C1	C1	T	D1	C1	N	N	N	C2	T	N	T	T	N	T
Polyacrylic Acid - 50%	D1	D1	D1	D1	D1	D1	T	N	N	D2	D2	T	T	D2	T	T
Potassium Acetate	A1	A1	A1	A1	D1	C1	D1	D2	D2	A2	A2	A2	A2	A2	D2	D2
Potassium Bichromate	A1	A1	A1	T	D1	C1	D1	D2	D2	A2	C2	D2	D2	D2	D2	C2
Potassium Bromide	A1	A1	A1	T	D1	C1	D1	D2	D2	A2	D2	C2	D2	C2	D2	D2
Potassium Carbonate - 25%	D1	D1	D1	A1	D1	C1	N	D1	D1	A2	A2	D2	A2	A2	C2	D2
Potassium Chlorate	B1	B1	C1	B1	D1	C1	C2	D2	D2	A2	A2	D2	A2	D2	D2	D2
Potassium Chloride	A1	A1	A1	A1	D1	C1	D1	D1	D1	A2	A2	A2	A2	A2	C2	A1
Potassium Cyanide	A1	A1	A1	A1	D1	C1	C2	C2	D2	A2	A2	A2	A2	A2	C2	D1
Potassium Fluoride*	T	D1	A1	A1	T	T	D2	D2	D2	A2	A2	D2	A2	D2	D2	D1
Potassium Hydroxide* - 10%	N	D1	D1	A1	N	N	N	D1	D1	A2	A2	D2	A2	A2	C2	D2
Potassium Hydroxide* - 50%	N	D1	D1	A1	T	N	N	D1	D1	D2	A2	D2	A2	A2	D2	B2
Potassium Nitrate	A1	A1	A1	A1	D1	C1	D1	D1	D1	A2	A2	A2	A2	A2	C2	A2
Potassium Permanganate	A1	A1	A1	N	D1	C1	D1	D1	D2	C2	D2	D2	D2	D2	D2	A2
Potassium Persulfate	A1	A1	A1	T	D1	C1	C2	T	T	A2	D2	C2	C2	T	D2	D2
Potassium Sulfate	A1	A1	A1	A1	D1	C1	D1	D1	D1	A2	A2	C2	A2	C2	C2	A2
Propanediol	D1	D1	D1	D1	D1	D1	D2	D2	D2	D2	D2	D2	D2	D2	D2	D2
Propionic Acid - 100%	D1	D1	D1	N	D1	D1	T	N	N	D2	N	N	N	T	N	N
Propylene Glycol	A1	B1	A1	B1	D1	C1	D1	D1	D1	B2	B2	A2	A2	A2	C2	D3
Pyridine	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N
Rayon Spin Liquor	A1	A1	A1	B1	D1	C1	C2	D2	D2	A2	C2	D2	C2	B2	N	N
Salicylaldehyde	D1	D1	D1	D1	D1	T	N	N	N	D2	D2	D2	D2	D2	T	T
Salicylic Acid (Benzoic Acid)	A1	A1	A1	C1	D1	C1	D2	D2	D2	A2	C2	D2	A2	C2	D2	A2
Salt Brine	A1	A1	A1	A1	D1	C1	D1	D1	D1	A2	A2	A2	A2	A2	C2	A2
Silicon Tetrachloride	D1	D1	D1	T	D3	D3	N	N	N	D2	T	T	T	T	T	T
Sodium Acetate	A1	A1	A1	A1	D1	C1	D1	D2	D2	A2	A2	A2	A2	A2	C2	A2
Sodium Bicarbonate	A1	A1	A1	A1	D1	C1	T	D1	D1	A2	A2	A2	A2	A2	C2	A2
Sodium Bisulfate	A1	A1	A1	A1	D1	C1	D1	D1	D1	A2	A2	D2	A2	A2	C2	A2
Sodium Bisulfite	A1	A1	A1	A1	D1	C1	D1	D1	D1	A2	A2	C2	A2	A2	C2	C2
Sodium Bromate	A1	A1	A1	D1	D1	D1	D1	C2	C2	A2	A2	A2	A2	T	D2	C2
Sodium Carbonate	D1	C1	C1	A1	D1	D1	T	D1	D1	A2	A2	D2	A2	A2	C2	A2
Sodium Chloride	A1	A1	A1	A1	D1	C1	D1	D1	D1	A2	A2	A2	A2	A2	C2	A2
Sodium Chlorite - 50%	C1	C1	C1	N	D1	D1	D2	D2	D2	D2	T	T	T	T	T	T
Sodium Chromate	A1	A1	A1	T	D1	C1	C2	T	T	A2	A2	C2	A2	C2	D2	C2
Sodium Chlorate	B1	B1	B1	B1	D1	C1	C2	D2	D2	A2	A2	A2	A2	A2	D2	A2
Sodium Cyanide	A1	A1	A1	A1	D1	C1	C2	D1	D1	A2	A2	A2	A2	A2	C2	A2
Sodium Dichromate	A1	A1	A1	D1	D1	C1	C2	D2	D2	A2	A2	C2	A2	C2	C2	A2
Sodium Fluoride*	N	D1	A1	A1	T	T	T	D2	D2	A2	A2	D2	A2	D2	D2	D2
Sodium Hydrosulfide - 45%	C1	C1	C1	N	D1	C1	N	N	N	C2	C2	C2	C2	C2	D2	C2
Sodium Hydroxide* - 10%	N	D1	D1	A1	N	N	N	D1	D1	C2	A2	D2	A2	A2	C2	A2
Sodium Hydroxide* - 50%	N	D1	D1	A1	D2	N	N	D1	D1	B2	A2	D2	A2	A2	D2	D2
Sodium Hypochlorite* - 3%	N	C1	D1	N	D2	N	N	N	N	D2	D2	N	D2	D2	N	N
Sodium Hypochlorite* - 17%	N	D1	N	N	D2	N	N	N	N	D2	N	N	N	N	N	N
Sodium Lauryl Sulfate - 20%	C1	C1	C1	C1	D1	D1	D2	D2	D2	C2	C2	D2	C2	C2	D2	C2
Sodium Oxalate	A1	A1	A1	A1	D1	C1	D1	D1	D1	A2	A2	A2	A2	A2	D2	A2
Sodium Peroxide	D1	D1	D1	T	D1	D1	T	T	T	D2	C2	D2	D2	D2	D2	D2
Sodium (Acid) Phosphate	A1	A1	A1	C1	D1	C1	D1	C2	C2	A2	A2	D2	D2	B2	D2	D2
Sodium Phosphate (Tri)	C1	C1	C1	A1	D1	C1	N	D1	D1	A2	A2	C2	A2	A2	C2	D2

* Duracor requires synthetic veil for fluorides, caustics and hypochlorites. Other products may require carbon filler.

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CEILCOTE

Corrosive Environment Tables

Chemical	MORTARS MEMBRANES: Bric Bond (Reg.) & Carbon	Compobond	Corobond	Polyester	Epoxy	Ceilcote 8303, 8305, HM 195	GROUTS: 640 Grout	Epoxy Grouts	DURACOR® FRP LAMINATES: Isophthalic Polyester	Bisphenol Polyester	Chlorinated Polyester	Vinyl Ester	Epoxy	Furan	DURACOR THERMOPLASTIC LAMINATES: Polyvinyl Chloride (PVC)	Polyvinyl Dichloride (CPVC)	Polypropylene (PP)	Kynar (PVDF)	Armalon (Teflon)
Perchloric Acid - 30%	N	A1	N	T	N	N	T	N	N	D1	N	D1	N	N	C1	B1	D1	B1	A1
Perchloroethylene	N	A1	A1	D1	D1	N	D2	D2	N	D1	D1	D1	D1	D1	N	N	N	B1	A1
Phenol - 5%	N	A1	A1	D1	N	N	D2	D2	N	D1	B1	B1	N	A1	D1	D1	D1	A1	A1
Phenol - 85%	N	A1	A1	T	N	N	N	N	N	N	N	T	N	D1	N	N	D1	D1	A1
Phenol Sulfonic Acid - 65%	T	A1	B1	D1	N	N	T	N	N	T	T	D1	N	B1	D1	D1	D1	A1	A1
Phosphoric Acid - 20%	A1	A1	A1	A1	N	D1	B2	D2	B1	A1	A1	A1	N	A1	D1	D1	B1	A1	A1
Phosphoric Acid - 85%	A1	N	A1	A1	N	N	C2	N	B1	A1	A1	A1	N	A1	D1	D1	B1	B1	A1
Phosphorous Oxychloride	T	A1	A1	N	C1	T	N	D2	N	T	T	A3	C1	D1	D1	D1	N	A1	A1
Phosphorous Trichloride	T	A1	A1	N	C1	T	D2	D2	N	N	N	N	D1	D1	N	N	N	A1	A1
Picric Acid - 10% in Alcohol	N	A1	T	D1	T	N	T	T	T	D1	D1	C1	T	N	D1	D1	D1	A1	A1
Polyacrylic Acid - 50%	N	A1	A1	D1	D1	T	D2	D2	T	D1	T	D1	D1	A1	N	N	N	D1	A1
Potassium Acetate	C1	A1	A1	A1	A1	C1	A2	A2	A1	A1	A1	A1	B1	A1	D1	D1	A1	A1	A1
Potassium Bichromate	T	A1	N	A1	A2	A1	D2	C2	B1	A1	A1	A1	T	N	C1	B1	D1	A1	A1
Potassium Bromide	A1	A1	D2	A1	T	D1	C2	D2	B1	A1	A1	A1	T	N	C1	B1	B1	A1	A1
Potassium Carbonate - 25%	D2	N	A1	D1	A1	D1	A2	A2	N	B1	N	C1	A1	A1	C1	B1	A1	A1	A1
Potassium Chlorate	T	A1	A1	A1	C1	A1	D2	A2	C1	A1	A1	A1	C1	B1	C1	B1	D1	A1	A1
Potassium Chloride	A1	C1	A1	A1	A1	A1	A2	A2	C1	A1	A1	A1	A1	B1	C1	B1	A1	A1	A1
Potassium Cyanide	A2	D2	A1	A1	A1	A1	A2	A2	D1	A1	B1	A1	A1	A1	C1	B1	A1	A1	A1
Potassium Fluoride*	D2	N	A1	D1	A1	D1	D2	A2	D1	B1	C1	B1	D1	A1	C1	B1	A1	A1	A1
Potassium Hydroxide* - 10%	N	N	D1	D1	A1	D1	D2	A2	N	D1	N	D1	A1	A1	C1	B1	B1	A1	A1
Potassium Hydroxide* - 50%	N	N	A1	D1	A1	D1	D2	A2	N	B1	N	D1	A1	A1	C1	B1	D1	B1	A1
Potassium Nitrate	A1	D1	A1	A1	A1	A1	A2	A2	A1	A1	A1	A1	A1	D1	C1	B1	C1	A1	A1
Potassium Permanganate	A1	A1	A1	A1	N	A1	A2	A2	A1	A1	A1	A1	N	T	C1	B1	D1	A1	A1
Potassium Persulfate	T	A1	A1	A1	T	A1	D2	A2	D1	C1	D1	A1	T	A1	C1	B1	D1	A1	A1
Potassium Sulfate	A1	A1	A1	A1	A1	A1	C2	A2	A1	A1	A1	A1	A1	A1	C1	B1	A1	A1	A1
Propanediol	D2	A1	A1	D1	D1	T	D2	D2	D1	D1	D1	D1	D1	A1	D1	D1	B1	A1	A1
Propionic Acid - 100%	N	A1	A1	D1	N	N	T	N	N	D1	N	D1	N	D1	D1	D1	D1	A1	A1
Propylene Glycol	T	A1	A1	D1	D1	T	A2	D2	B1	B1	A1	A1	C1	A1	C1	B1	B1	A1	A1
Pyridine	N	A1	T	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	C1
Rayon Spin Liquor	C2	A1	A1	A1	B1	C1	B2	C2	D1	A1	B1	A1	D1	A1	C1	B1	A1	A1	A1
Salicylaldehyde	N	A1	A1	N	T	N	D2	T	T	D1	D1	D1	D1	B1	N	N	T	D1	A1
Salicylic Acid (Benzoic Acid)	A1	A1	A1	A1	D1	D1	C2	A2	D1	C1	C1	B1	C1	D1	C1	B1	D1	D1	A1
Salt Brine	A1	A2	A1	A1	A1	A1	A2	A2	A1	A1	A1	A1	A1	A1	C1	B1	A1	A1	A1
Silicon Tetrachloride	T	T	D1	D1	T	T	T	T	T	D3	D1	T	T	D1	D1	D1	D1	B1	A1
Sodium Acetate	D1	A1	A1	A1	A1	A1	A2	A2	A1	A1	A1	A1	A1	A1	B1	B1	A1	A1	A1
Sodium Bicarbonate	A1	A1	A1	A1	A1	A1	A2	A2	T	A1	A1	A1	A1	A1	C1	B1	A1	A1	A1
Sodium Bisulfate	A1	A1	A1	A1	A1	A1	A2	A2	A1	A1	A1	A1	A1	A1	C1	B1	A1	A1	A1
Sodium Bisulfite	D1	A1	A1	A1	A1	A1	A2	A2	A1	A1	A1	A1	A1	A1	C1	B1	A1	A1	A1
Sodium Bromate	A1	A1	D1	A1	D1	A1	D2	A2	A1	A1	A1	A1	D1	D1	C1	B1	D1	A1	A1
Sodium Carbonate	D2	N	A1	D1	A1	A1	A2	A2	N	B1	N	B1	A1	A1	C1	B1	A1	A1	A1
Sodium Chloride	A1	A1	A1	A1	A1	A1	A2	A2	A1	A1	A1	A1	A1	A1	C1	B1	A1	A1	A1
Sodium Chlorite - 50%	T	T	T	D1	N	N	T	N	N	D1	D1	D1	N	N	C1	B1	D1	A1	A1
Sodium Chromate	T	A1	C2	A1	T	A1	C2	A2	D1	A1	A1	A1	T	N	C1	B1	D1	A1	A1
Sodium Chlorate	N	N	D1	B1	B1	D1	B2	A2	C1	B1	B1	B1	B1	B1	A1	A1	A1	A1	A1
Sodium Cyanide	T	N	A1	A1	A1	A1	A2	A2	D1	A1	B1	A1	A1	A1	C1	B1	B1	A1	A1
Sodium Dichromate	A1	A1	N	B1	D1	A1	C2	A2	D1	A1	A1	A1	D1	N	C1	B1	D1	A1	A1
Sodium Fluoride*	A1	N	A1	D1	D1	A1	D2	D2	D1	B1	C1	B1	D1	B1	B1	B1	A1	B1	A1
Sodium Hydrosulfide - 45%	N	N	B1	C2	N	T	C2	C2	N	C1	N	B1	N	B1	A1	A1	A1	A1	A1
Sodium Hydroxide* - 10%	N	N	A1	D1	A1	D1	A2	A2	N	C1	N	T	A1	A1	C1	C1	B1	A1	A1
Sodium Hydroxide* - 50%	N	N	A1	D1	A1	N	A2	A2	N	C1	N	T	A1	B1	C1	C1	D1	B1	B1
Sodium Hypochlorite* - 3%	N	N	N	D1	N	T	D2	N	N	D1	N	C1	N	N	C1	B1	D1	A1	A1
Sodium Hypochlorite* - 17%	N	N	N	N	N	N	N	N	N	N	N	D1	N	N	C1	B1	N	A1	A1
Sodium Lauryl Sulfate - 20%	C2	N	B1	C1	C1	T	C2	C2	T	C1	D1	C1	C1	B1	A1	A1	A1	A1	A1
Sodium Oxalate	A1	A1	A1	A1	A1	A1	A2	A2	A1	A1	A1	A1	A1	D1	C1	C1	D1	A1	A1
Sodium Peroxide	N	N	N	D1	T	D1	D2	A2	N	A1	N	A1	T	N	C1	C1	D1	A1	A1
Sodium (Acid) Phosphate	A1	A1	A1	A1	C1	A1	B2	A2	A1	A1	A1	A1	D1	A1	C1	A1	A1	A1	A1
Sodium Phosphate (Tri)	N	N	A1	C1	A1	A1	A2	A2	N	A1	N	A1	A1	A1	C1	A1	A1	A1	A1

KEY TO CHEMICAL RESISTANCE CHART

Rating	Meaning
A	Good to Maximum Temperature of Product
B	Good to 160°F (71°C) Maximum
C	Good to 140°F (60°C)
D	Good to 100°F (37°C) Ambient
1	Immersion or Constant Flow
2	Intermittent or Spillage Only
3	Fumes Only
N	Not Recommended
T	Varies With Conditions. May Require Test. Consult Ceilcote for Recommendation.

A UNIT OF GENERAL SIGNAL GS

CEILCOTE

Corrosive Environment Tables

	LININGS				COATINGS					FLOOR TOPPINGS						
	Flakeline 100 Series	Lining Series	Ceilcrete Series	Coroline Series	Flakeline 200 Series	Flakeline 222HT	Flakeline 300	Flakeline 600	Flaketar	Ceilcrete Series	Coroline Series	681, 685 Floors	682, 683 Floors	687 Floors	Corocrete SR	Sealants
Sodium Polymethacrylate	D1	D1	D1	D1	D1	D1	D1	D2	D2	D2	D2	D2	D2	D2	D2	D2
Sodium Sulfate	A1	A1	A1	A1	D1	C1	D1	D1	D1	A2	A2	A2	A2	A2	C2	A2
Sodium Sulfide	C1	C1	C1	A1	D1	C1	N	D1	D1	A2	A2	C2	A2	A2	C2	D2
Sodium Sulfite	A1	A1	A1	C1	D1	C1	D1	D1	D1	A2	A2	A2	A2	A2	C2	D2
Sodium Tartrate	A1	A1	A1	A1	D1	C1	D1	D1	D1	A2	A2	A2	A2	A2	C2	A2
Sodium Thiosulfate (Hypo)	A1	A1	A1	A1	D1	C1	C2	T	T	A2	A2	A2	A2	A2	C2	A2
Soybean Oil	A1	A1	A1	T	C1	C1	D1	T	T	A2	D2	C2	D2	C2	D2	T
Stearic Acid	B1	B1	B1	N	C1	C1	D1	N	N	A2	D2	D2	D2	D2	D2	T
Styrene	D1	D1	D1	D1	D1	D1	T	N	N	D2	D2	T	D2	D3	T	T
Sugar	A1	A1	A1	A1	D1	C1	D1	D1	D1	A2	A2	A2	A2	A2	C2	A2
Sulfamic Acid - 25%	C1	C1	C1	N	D1	C1	D2	N	N	C2	D2	T	D2	D2	T	T
Sulfite Liquor (Paper)	A1	A1	A1	A1	D1	C1	C2	D2	D2	A2	A2	A2	A2	A2	D2	D2
Sulfur Dioxide (Wet)	A3	A3	A3	C3	D3	C3	C2	D3	D3	not applicable for gases						D3
Sulfur Trioxide (Wet)	A3	A3	A3	N	D3	C3	T	N	N	not applicable for gases						D3
Sulfuric Acid 1 - 20%	A1	A1	A1	D1	D1	C1	D1	N	N	A2	D2	D2	D2	B2	N	D2
Sulfuric Acid 21 - 50%	C1	C1	C1	N	D1	D1	D2	N	N	C2	D2	D2	D2	C2	N	D2
Sulfuric Acid 51 - 85%	D1	D1	D1	N	D2	D2	D3	N	N	D2	N	N	N	D2	N	N
Sulfuric Acid 86 - 98%	T	T	T	N	N	N	N	N	N	D2	N	N	N	N	N	N
Sulfuric Acid - Oleum	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N
Sulfurous Acid (Sat'd)	A1	A1	A1	C1	D1	C1	C2	D2	D2	A2	A2	D2	D2	B2	D2	D2
Tall Oil	A1	A1	A1	B1	D1	C1	C2	N	N	A2	A2	C2	D2	C2	D2	D2
Tartaric Acid	A1	A1	A1	D1	D1	C1	D1	D2	D2	A2	A2	A2	A2	A2	C2	A2
Tetrachloroethane	D1	D1	D1	D1	D1	D1	N	N	N	D2	D2	N	T	T	N	N
Tetrachloroethylene	D1	D1	D1	D1	D1	D1	N	N	N	D2	D2	T	D2	D2	T	N
Tetrahydrofuran	N	N	N	N	N	N	N	N	N	D2	N	N	N	T	N	N
Tetrahydrofurfuryl Alcohol	D1	D1	D1	T	D1	D1	D3	T	T	C2	D2	D2	D2	D2	D2	T
Thionyl Chloride	N	N	N	N	N	N	N	N	N	N	T	N	N	N	N	N
Thionyl Chloride - Water Sol'n	N	N	N	T	N	N	N	N	N	N	T	N	N	N	N	N
Tin Plating (Fluoborate)	See Fluoboric Acid															
Tin Plating (Stannate)	See Sodium Hydroxide															
Titanium Tetrachloride	A1	A1	A1	D1	D1	C1	C2	D2	D2	A2	A2	A2	A2	C2	D2	D2
Toluol (Toluene)	D1	D1	D1	T	D1	D1	T	N	N	C2	D2	D2	D2	D2	N	N
Toluene Sulfonic Acid	A1	A1	A1	T	D1	C1	C2	D2	D2	A2	D2	A2	D2	D2	D2	D2
Toluidine	D1	D1	D1	N	D1	T	T	N	N	D2	T	T	T	T	N	N
Triethylamine	D1	D1	D1	T	D1	D1	T	N	N	D2	T	N	T	T	N	T
Triethylenetetramine	D1	D1	D1	T	D1	D1	T	N	N	D2	T	N	T	T	N	T
Triethyl Phosphite	D1	D1	D1	D1	D1	D1	D2	T	T	D2	D2	T	D2	D2	D2	T
Trichloroacetic Acid - 20%	C1	C1	C1	N	D1	C1	D2	N	N	C2	N	D2	N	D2	N	D2
Trichlorobenzene	D1	D1	D1	D1	D1	D1	T	N	N	D2	D2	T	D2	D2	T	N
Trichloroethane	D1	D1	D1	D1	D1	D1	T	N	N	C2	C2	N	D2	D2	N	N
Trichloroethylene	D1	D1	D1	D1	D1	N	T	N	N	C2	C2	N	D2	D2	N	N
Tricresyl Phosphate	C1	C1	C1	D1	D1	D1	D2	N	N	C2	C2	T	D2	D2	T	T
Trisodium Phosphate	C1	C1	C1	A1	D1	C1	T	D1	D1	A2	A2	C2	A2	A2	C2	A2
Turpentine	D1	D1	D1	D1	D1	C1	T	T	N	C2	A2	D2	D2	C2	C2	D2
Urea Solutions	A1	A1	A1	A1	D1	C1	C2	D1	D1	A2	A2	A2	A2	A2	C2	A2
Vinegar	A1	A1	A1	C1	D1	C1	D1	N	N	A2	A2	C2	D2	B2	D2	A2
Vinyl Acetate (Monomer)	T	T	T	T	T	T	N	N	N	T	D2	T	D2	D2	T	N
Vinyl Chloride	T	T	T	T	T	T	T	N	N	D2	D2	N	D2	D2	T	N
Water, Distilled & Demineralized	B1	B1	C1	B1	D1	C1	D1	D1	D1	A2	A2	A2	A2	A2	C2	A2
White Liquor (Paper)	C1	C1	C1	A1	D1	C1	C2	C2	D2	A2	A2	A2	A2	A2	C2	D2
Wine	A1	A1	A1	A1	D1	C1	D1	D1	D1	A2	A2	A2	A2	A2	C2	A2
Xylol (Xylene)	D1	D1	D1	D1	D1	D1	N	N	N	D2	D2	D2	D2	D2	N	N
Zinc Plating - Acid Fluoborate	See Fluoboric Acid															
Zinc Plating - Cyanide	See Sodium Hydroxide 10%															
Zinc Plating - Acid Sulfate	A1	A1	A1	C1	D1	C1	C2	C2	D2	A2	A2	A2	C2	C2	D2	D2

* Duracor requires synthetic veil for fluorides, caustics and hypochlorites. Other products may require carbon filler.

A UNIT OF GENERAL SIGNAL GS

CEILCOTE

Corrosive Environment Tables

	MORTARS MEMBRANES						GROUTS	
	Bric Bond (Reg.) & Carbon	Compobond	Corobond	Polyester	Epoxy	Ceilcote 8303, 8305, HM 195	640 Grout	Epoxy Grout
Sodium Polymethacrylate	D2	T	A1	D1	D1	T	D2	D2
Sodium Sulfate	A1	A1	A1	A1	A1	A1	A2	A2
Sodium Sulfide	N	N	A1	C1	A1	A1	A2	A2
Sodium Sulfite	N	A1	A1	A1	A1	A1	A2	A2
Sodium Tartrate	A1	A1	A1	A1	A1	A1	A2	A2
Sodium Thiosulfate (Hypo)	A1	A1	A1	A1	A1	A1	A2	A2
Soybean Oil	T	A1	A1	A1	T	N	C2	D2
Stearic Acid	D1	A1	A1	B1	N	N	D2	D2
Styrene	N	A1	A1	D1	D1	N	D2	D2
Sugar	A1	A1	A1	A1	A1	A1	A2	A2
Sulfamic Acid - 25%	T	A1	A1	C1	N	D1	D2	D2
Sulfite Liquor (Paper)	A1	A1	A1	A1	A1	T	A2	A2
Sulfur Dioxide (Wet)	A1	A1	A1	A3	C3	C1	A2	D3
Sulfur Trioxide (Wet)	A1	A1	B1	B1	N	D3	C2	D3
Sulfuric Acid 1 - 20%	C1	A1	A1	A1	D1	A1	B2	D2
Sulfuric Acid 21 - 50%	C1	A1	A1	A1	N	D1	C2	D2
Sulfuric Acid 51 - 85%	D1	C1	D1	D1	N	T	D2	N
Sulfuric Acid 86 - 98%	C2	D1	N	N	N	T	N	N
Sulfuric Acid - Oleum	N	D1	N	N	N	N	N	N
Sulfurous Acid (Sat'd)	A1	A1	A1	A1	C1	A1	B2	A2
Tall Oil	N	A1	A1	A1	B1	N	C2	A2
Tartaric Acid	D1	A1	A1	A1	D1	D1	A2	A2
Tetrachloroethane	N	A1	D1	N	D1	N	T	T
Tetrachloroethylene	N	A1	B1	D1	D1	N	D2	D2
Tetrahydrofuran	N	A1	D1	N	N	N	T	N
Tetrahydrofurfuryl Alcohol	N	A1	A1	D	T	N	D2	D2
Thionyl Chloride	T	T	T	N	N	N	N	N
Thionyl Chloride - Water Sol'n	T	T	T	N	T	N	N	N
Tin Plating (Fluoborate)	See Fluoboric Acid							
Tin Plating (Stannate)	See Sodium Hydroxide							
Titanium Tetrachloride	A1	A1	A1	A1	D1	A1	C2	D2
Toluol (Toluene)	N	A1	A1	D1	T	N	D2	D2
Toluene Sulfonic Acid	D1	A1	A1	A1	T	D1	D2	D2
Toluidine	N	A1	B1	D1	N	N	T	T
Triethylamine	N	N	B1	D1	T	N	T	T
Triethylenetetramine	N	N	B1	D1	T	N	T	T
Triethyl Phosphite	T	A1	B1	D1	D1	T	D2	D2
Trichloroacetic Acid - 20%	N	A1	A1	C1	N	T	D2	D2
Trichlorobenzene	N	A1	B1	D1	D1	N	D2	D2
Trichloroethane	N	A1	A1	D1	D1	N	D2	D2
Trichloroethylene	N	A1	A1	D1	D1	N	D2	D2
Tricresyl Phosphate	T	A1	B1	C1	D1	N	D2	D2
Trisodium Phosphate	N	N	A1	C1	A1	A1	A2	A2
Turpentine	N	A1	A1	D1	D1	N	C2	D2
Urea Solutions	A1	A1	A1	D1	A1	D1	A2	A2
Vinegar	D2	A1	A1	A1	D1	D1	B2	A2
Vinyl Acetate (Monomer)	D1	D1	D1	N	T	N	D2	T
Vinyl Chloride	N	A1	A1	N	T	N	D2	D2
Water, Distilled & Demineralized	A1	N	A1	A1	A1	B1	A2	A2
White Liquor (Paper)	D2	N	A1	B1	A1	D2	A2	A2
Wine	A2	A2	A1	A1	A1	A1	A2	A2
Xylol (Xylene)	N	A1	A1	D1	D1	N	D2	D2
Zinc Plating - Acid Fluoborate	See Fluoboric Acid							
Zinc Plating - Cyanide	See Sodium Hydroxide 10%							
Zinc Plating - Acid Sulfate	A1	A2	A1	A1	A1	A1	C2	A2

	DURACOR* FRP LAMINATES						DURACOR THERMOPLASTIC LAMINATE				
	[illegible] Polyester	Bisphenol Polyester	Chlorinated Polyester	Vinyl Ester	Epoxy	Furan	Polyvinyl Chloride (PVC)	Polyvinyl Dichloride (CPVC)	Polypropylene (PP)	Kynar (PVDF)	Armalon (Teflon)
Sodium Polymethacrylate	D1	D1	D1	D1	D1	B1	T	T	T	A1	A1
Sodium Sulfate	A1	A1	A1	A1	A1	A1	C1	A1	A1	A1	A1
Sodium Sulfide	N	A1	C1	A1	A1	A1	C1	A1	A1	A1	A1
Sodium Sulfite	A1	A1	A1	A1	A1	A1	C1	A1	A1	A1	A1
Sodium Tartrate	A1	A1	A1	A1	A1	A1	C1	A1	A1	A1	A1
Sodium Thiosulfate (Hypo)	D1	A1	A1	A1	A1	A1	C1	A1	A1	A1	A1
Soybean Oil	A1	A1	A1	A1	T	A1	D1	D1	D1	A1	A1
Stearic Acid	A1	B1	B1	A1	N	A1	D1	D1	D1	A1	A1
Styrene	T	D1	N	D1	D1	A1	N	N	N	D1	A1
Sugar	A1	A1	A1	A1	A1	A1	C1	A1	A1	A1	A1
Sulfamic Acid - 25%	C1	C1	C1	C1	N	A1	A1	A1	A1	A1	A1
Sulfite Liquor (Paper)	C1	A1	C1	A1	A1	D1	C1	B1	D1	A1	A1
Sulfur Dioxide (Wet)	C3	C3	A3	A3	D3	D1	N	N	D1	B1	A1
Sulfur Trioxide (Wet)	C3	A3	A3	A3	N	N	D1	D1	N	N	A1
Sulfuric Acid 1 - 20%	C1	A1	A1	A1	D1	A1	C1	D1	B1	A1	A1
Sulfuric Acid 21 - 50%	C1	A1	A1	A1	N	A1	C1	B1	B1	A1	A1
Sulfuric Acid 51 - 85%	N	D1	D1	D1	N	D1	C1	B1	D1	A1	A1
Sulfuric Acid 86 - 98%	N	N	N	D3	N	N	D1	D1	N	D1	B1
Sulfuric Acid - Oleum	N	N	N	N	N	N	N	N	N	N	D1
Sulfurous Acid (Sat'd)	A1	A1	A1	A1	C1	D1	N	N	C1	A1	A1
Tall Oil	D1	A1	A1	A1	B1	A1	C1	C1	D1	A1	A1
Tartaric Acid	A1	A1	A1	A1	C1	A1	C1	A1	A1	A1	A1
Tetrachloroethane	N	T	D1	D1	D1	B1	N	N	N	D1	D1
Tetrachloroethylene	N	D1	N	D1	D1	A1	N	N	N	A1	A1
Tetrahydrofuran	N	N	N	N	N	D1	N	N	N	N	B1
Tetrahydrofurfuryl Alcohol	N	D1	D1	D1	T	D1	N	N	N	B1	A1
Thionyl Chloride	N	N	N	N	N	N	N	N	N	N	B1
Thionyl Chloride - Water Sol'n	N	N	N	N	N	B1	N	N	N	B1	A1
Tin Plating (Fluoborate)											
Tin Plating (Stannate)											
Titanium Tetrachloride	D1	A1	A1	A1	D1	A1	N	N	D1	A1	A1
Toluol (Toluene)	N	D1	D1	D1	T	B1	N	N	N	C1	A1
Toluene Sulfonic Acid	D1	A1	A1	A1	T	B1	D1	D1	C1	A1	A1
Toluidine	T	T	D1	D1	N	B1	T	T	D1	A1	A1
Triethylamine	T	D1	D1	D1	N	B1	D1	D1	D3	D1	A1
Triethylenetetramine	T	D1	D1	D1	N	B1	D1	D1	D1	B1	A1
Triethyl Phosphite	T	D1	D1	D1	D1	B1	N	N	D1	A1	A1
Trichloroacetic Acid - 20%	D1	A1	A1	A1	N	D1	C1	C1	D1	A1	A1
Trichlorobenzene	N	D1	D1	D1	D1	A1	N	N	N	D1	B1
Trichloroethane	N	D1	D3	D1	D1	B1	N	N	N	D1	A1
Trichloroethylene	N	D1	D3	N	D1	B1	N	N	N	B1	A1
Tricresyl Phosphate	T	C1	C1	C1	D1	B1	D1	D1	B1	A1	A1
Trisodium Phosphate	N	A1	D1	A1	A1	A1	C1	B1	A1	A1	A1
Turpentine	D1	A1	D1	A1	D1	A1	D1	D1	N	A1	A1
Urea Solutions	D1	B1	B1	C1	C1	A1	C1	B1	A1	A1	A1
Vinegar	A1	A1	A1	A1	D1	A1	C1	B1	A1	A1	A1
Vinyl Acetate (Monomer)	N	N	N	T	T	D1	N	N	N	D1	A1
Vinyl Chloride	N	T	N	T	T	D1	N	N	N	D1	D1
Water, Distilled & Demineralized	B1	B1	B1	B1	B1	A1	C1	B1	A1	A1	A1
White Liquor (Paper)	N	C1	N	C1	A1	D1	C1	B1	D1	A1	A1
Wine	A1	A1	A1	A1	A1	A1	D1	D1	A1	A1	A1
Xylol (Xylene)	T	D1	D1	D1	D1	B1	N	N	N	A1	A1
Zinc Plating - Acid Fluoborate											
Zinc Plating - Cyanide											
Zinc Plating - Acid Sulfate	A1	A1	A1	A1	C1	A1	C1	B1	A1	A1	A1

KEY TO CHEMICAL RESISTANCE CHART

Rating	Meaning
A	Good to Maximum Temperature of Product
B	Good to 160°F (71°C) Maximum
C	Good to 140°F (60°C)
D	Good to 100°F (37°C) Ambient

Rating	Meaning
1	[illegible] Constant Flow
2	[illegible] Usage Only
3	[illegible]

Rating	Meaning
T	Varies With Conditions. May Require Test. Consult Ceilcote for Recommendation

Ceilcote offers a full line of coating formulations.

The more coatings you have to choose from, the better the ~hances that you'll find the ıe for your specific corrosion problem. Ceilcote offers a wide selection:

Polyesters

Ceilcote flake-reinforced polyester coatings control corrosion by reducing permeation. These coatings are formulated with a large proportion of laminar, micron-thick flakes that overlap in multiple layers to form a uniform, almost impenetrable barrier against moisture. Polyesters resist a wide range of chemical environments. (They are particularly effective against acids.) They are widely used for protecting oil production tanks, chemical waste treat-ɜnt facilities, chemical pro-ᴗess tanks and equipment, marine structures, plating facilities, and buried pipes and equipment — everywhere that maximum corrosion protection is required.

Epoxies

Ceilcote epoxy coatings also employ flake pigmentation for improved resistance to moisture permeation, alkalis and many solvents. Although they do not exhibit the superior acid resistance of polyester coatings, Ceilcote epoxies are generally superior to conventional epoxy formulations. They're versatile, used in many industrial, chemical and marine applications, and many et FDA or air emission stanᴗards. Several will cure below freezing.

Vinyls

Ceilcote vinyl coatings provide excellent corrosion resistance, and are easy to apply. They dry quickly to a non-yellowing, non-chalking, low-gloss finish. They're ideal for offshore, marine,and industrial use where protection is required from chemical fumes, salt water, fresh water and spillage.

Polyurethanes

Ceilcote polyurethanes cure to a high-gloss, non-chalking finish. They exhibit outstanding weathering and color retention qualities and cure at low temperatures. Polyurethanes are used as decorative and protective finish coats for metal and concrete in heavy industrial as well as marine and offshore atmospheres where long maintenance-free life is required.

Chlorinated Rubber

Ceilcote chlorinated rubber coatings dry *fast* and give excellent protection to metals, concrete and masonry. They are recommended as a maintenance system against acid and alkali fumes in chemical processing plants, pulp and paper mills and railroads. Chlorinated rubber coatings may also be used in marine and offshore environments.

Alkyds

Ceilcote's alkyds are fast, air-dry coatings. Their high gloss and color retention properties are excellent when exposed to mild industrial fumes, marine atmospheres and weathering.

Silicones (Aluminum)

Ceilcote has heat-resistant, aluminum pigmented coatings for general-purpose protection of steel surfaces which operate at temperatures as high as 1000°F. They have limited resistance to severe chemical environments.

Primers

As part of the total protection system, Ceilcote offers primers for virtually every application. These Ceilcote primers are used (1) as surface preparation so the coating will adhere to the substrate, (2) as the first layer of a multiple-layer coating system to provide added corrosion protection, or (3) as a corrosion inhibitor until the surface can be properly coated. Ceilcote offers organic and inorganic primers (zinc, red lead, etc.) as well as a variety of special-purpose primers.

Coatings Selection Guide

This chart provides easy reference to the chemical resistance and physical properties of Ceilcote coatings. For more specific product recommendations, consult your Ceilcote representative.

LEGEND

O — OUTSTANDING
E — EXCELLENT
VG — VERY GOOD
G — GOOD
F — FAIR
L — LIMITED
P — POOR
A — ALL COLORS
N/R — NOT RECOMMENDED

PRODUCT NAME	TYPE	ATMOSPHERIC ENVIRONMENTS				SPLASH & SPILL				PHYSICAL PROPERTIES			
		ACIDS	ALKALIS	OXIDANTS	SOLVENTS	ACIDS	ALKALIS	OXIDANTS	SOLVENTS	[illegible]	HEAT STABILITY	AVAILABLE COLORS	GLOSS RETENTION
POLYESTERS													
Flakeline 211/212	Polyester	[illegible]	L	E	G	[illegible]	L	E	G	[illegible]	E	L	F
Flakeline 222 H.T.	Vinyl Ester	[illegible]	L	O	VG	[illegible]	L	O	VG	[illegible]	O	L	F
Flakeline 232	Vinyl Ester	[illegible]	F	E	G	[illegible]	F	E	G	[illegible]	E	L	F
Flakeline 242	Vinyl Ester	[illegible]	F	E	L	[illegible]	F	E	L	[illegible]	E	L	F
Flakeline 251/252	Polyester	[illegible]	G	E	G	[illegible]	G	E	G	[illegible]	E	L	F
Flakeline 262	Polyester	[illegible]	L	E	G	[illegible]	L	E	G	[illegible]	G	L	F
Flakeline 300/350	Polyester	[illegible]	L	E	G	[illegible]	L	E	G	[illegible]	E	L	F
EPOXIES													
Flaketar	Coal Tar Epoxy	[illegible]	E	L	L	[illegible]	G	N/R	N/R	[illegible]	E	L	P
Flakeline 600	Epoxy Adduct	[illegible]	E	L	G	[illegible]	E	L	G	[illegible]	G	A	F
650 H.B.	Epoxy Polyamide	[illegible]	E	L	G	[illegible]	E	N/R	F	[illegible]	G	A	G
650 F.D.A.	Epoxy Polyamide	[illegible]	E	L	G	[illegible]	E	N/R	F	[illegible]	G	A	G
660	C.T.E. Polyamide	[illegible]	E	L	L	[illegible]	G	N/R	N/R	[illegible]	E	L	P
670	Epoxy Polyamide	[illegible]	E	L	G	[illegible]	E	N/R	F	[illegible]	G	A	G
900	Epoxy Ester	[illegible]	F	P	L	N/R	N/R	N/R	N/R	[illegible]	[illegible]	A	G
VINYLS													
700	Vinyl Copolymer	[illegible]	E	E	L	G	VG	G	N/R	[illegible]	[illegible]	A	F
742	Vinyl Copolymer	[illegible]	E	E	L	G	VG	G	N/R	[illegible]	[illegible]	A	F
750	Vinyl Chloride	[illegible]	E	E	L	VG	VG	G	N/R	[illegible]	L	A	F
CHLORINATED RUBBER													
550	Chlorinated Rubber	G	G	G	L	N/R	N/R	N/R	N/R	[illegible]	F	A	F
URETHANES													
470	Aliphatic Acrylic Polyurethane	G	E	L	E	G	G	N/R	E	[illegible]	G	A	E
480	Aliphatic Polyester Polyurethane	G	E	L	E	G	G	N/R	E	[illegible]	G	A	E
ALKYDS													
930	Alkyd Medium Oil	[illegible]	P	F	L	N/R	N/R	N/R	N/R	[illegible]	F	A	F
932	Silicone Alkyd	[illegible]	P	F	L	N/R	N/R	N/R	N/R	[illegible]	G	A	F
940	Alkyd Medium Oil	F	P	F	L	N/R	N/R	N/R	N/R	[illegible]	F	A	F
SILICONES (Aluminum)													
810	Silicone 1,000°F	L	L	L	L	N/R	N/R	N/R	N/R	[illegible]	E	L	G
850	Silicone 500°F	L	L	L	L	N/R	N/R	N/R	N/R	[illegible]	E	L	G
870	Silicone 1,000°F	L	L	L	L	N/R	N/R	N/R	N/R	[illegible]	O	L	G

Ceilcote...a research-oriented company.

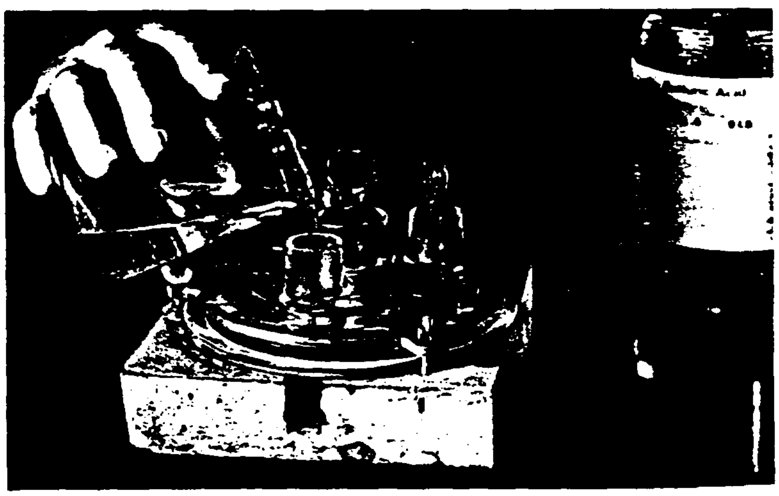
Ceilcote added a computer controlled electromechanical tester and controlled temperature cabinet for complete material evaluation capability. A 60,000-lb. hydraulic tester is used for high capacity testing. Both are interfaced to a microprocessor and printer for data computation and report printing.

Ceilcote's large modern laboratories are staffed with chemists and engineers experienced in applied research, product development, and testing of corrosion-resistant materials.

In developing new products, Ceilcote's laboratory evaluates the performance of new polymers and compounds in corrosive media. Materials are evaluated for chemical resistance by various standard test methods such as ASTM C 581 and C 868 as well as proprietary Ceilcote techniques. Performance in chemical resistance tests is evaluated based on changes in strength, weight, hardness, appearance, dimension and other factors.

In addition to chemical resistance, tests are also conducted to evaluate and optimize properties such as abrasion resistance, bond strength, cure rate, hardness, impact resistance, thermal shock resistance and other properties.

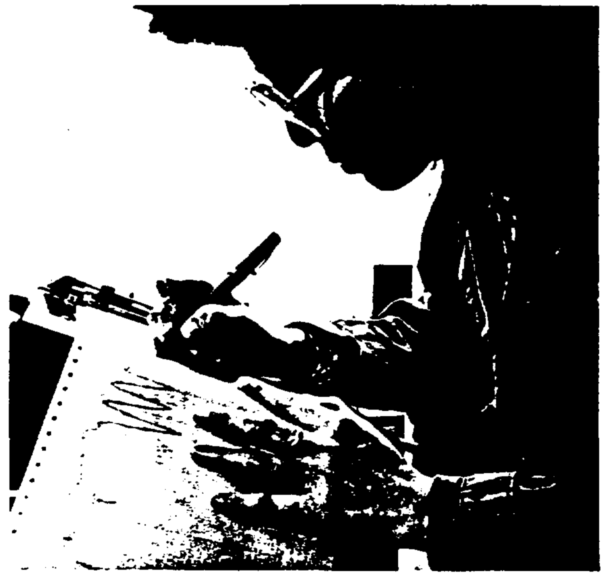
Thorough lab testing plus actual field test experience forms the basis for the recommendations contained in this chemical resistance guide. If you have a corrosion problem, the chances are that Ceilcote has solved it — or one quite similar — during our fifty years in the field of corrosion protection. Whatever the problem, Ceilcote has the facilities and corrosion specialists to solve it.



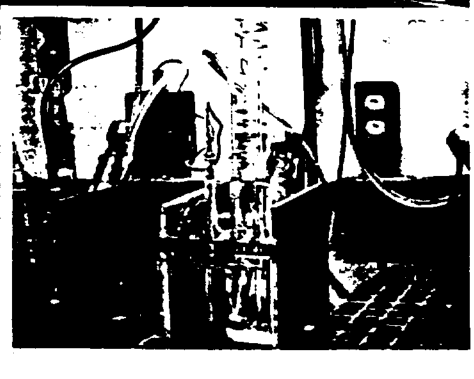
Where standard test methods do not exist, internal procedures are developed such as this surface immersion test to simulate severe floor spills. A Ceilcote monolithic floor system, including expansion joint, is shown to resist 98% sulfuric acid

Stereomicroscopy is used to study minute changes which occur in corrosion-resistant systems during chemical exposure or actual field service. Photographic capability provides instant documentation.

A Ceilcote chemist inspects the graph from an infrared spectrophotometer to study the curing rate of an experimental polymer formulation.



Ceilcote has relied heavily upon simulated service testing using the ASTM C-868 cell test method for 20 years. In a special laboratory, 50-70 cells challenge linings from 6 months to over 3 years.



This method uses a steel or concrete test panel simulating an in-service vessel containing a heated solution. The temperature gradient across the corrosion-resistant lining is essential to produce the permeation driving force.

APPENDIX D-3
TANK LININGS USED AT CWTP-2

The following pages present data on the linings used on the acid, chrome and alkali tanks at CWTP-2. This includes hypalon used on these tanks.

chemical resistance of the Du Pont elastomers

Du Pont elastomers are used widely and successfully in contact with a broad variety of chemicals. To assist engineers in selecting the appropriate elastomer for the particular environment, the accompanying tabulation has been prepared. We emphasize that it should be used as a guide only. The tabulation is based on laboratory tests and records of actual service performance. But an elastomer's degree of compatibility with a particular fluid also depends on such variables as temperature, aeration, velocity of flow, duration of exposure, stability of the fluid, degree of contact, etc. Therefore, it is always advisable to test the material under actual service conditions before specification. If this is not practical, tests should be devised that simulate service conditions as closely as possible.

CHEMICAL	NEOPRENE	HYPALON®	VITON®	ADIPRENE®	NORDEL®
Acetic acid, 20%	A	A	X	B	T
Acetic acid, 30%	A	A	X	—	T
Acetic acid, glacial	B	B	C	—	B
Acetic anhydride	A	A	C	T	T
Acetone	B	B	C	C	A
Acetylene	B	B	T	—	—
Aluminum chloride solutions	A	A	A	T	T
Aluminum sulfate solutions	A(158°F)	A(250°F)	T	T	T
Ammonia, anhydrous	A	B	C	T	T
Ammonium hydroxide solutions	A(158°F)	A(200°F)	A	A	A
Ammonium chloride solutions	A	A	T	T	T
Ammonium sulfate solutions	A(158°F)	A(200°F)	T	T	T
Amyl acetate	C	C	C	C(122°F)	X
Amyl alcohol	A(158°F)	A(200°F)	A(212°F)	T	A
Aniline	C	B	A	—	A-B
Aniline	—	C(100°F)	B(158°F)	—	—
Aniline	—	—	C(300°F)	—	—
ASTM hydrocarbon test fluid	X	X	A(350°F)	T	C
ASTM oil #1	A	A	A(300°F)	A(158°F)	C
ASTM oil #3	B(158°F)	B(158°F)	A(350°F)	B(158°F)	C
ASTM reference fuel A	A	A	A	A	C
ASTM reference fuel B	C	C	A	B(122°F)	C
ASTM reference fuel C	C	C	A	C	X
Asphalt	C	C	A (400°F)	—	X
Barium hydroxide solutions	A(158°F)	A(200°F)	T	A	T
Benzaldehyde	C	C	C	—	B
Benzene	C	C	B(158°F)	C(158°F)	C
Benzoyl chloride	C	C	T	T	C
Borax solutions	A(158°F)	A(200°F)	T	A	T
Boric acid solutions	A(158°F)	A(200°F)	T	A	A
Bromine, anhydrous liquid	C	B	A(212°F)	X	C
Butane	A	A	T	A	B
Butyl acetate	C	C	C	C	X
Butyraldehyde	B	B-C	T	T	X
Butyric acid	C	B-C	T	—	X
Calcium bisulfite solutions	A(158°F)	A(200°F)	T	A	T
Calcium chloride solutions	A	A	T	T	T
Calcium hydroxide solutions	A(158°F)	A(200°F)	T	A	T
Calcium hypochlorite, 5%	B	A	T	T	T
Calcium hypochlorite, 20%	X	A(200°F)	T	—	T
Carbon bisulfide	C	C	A	T	T
Carbon dioxide	A	A(200°F)	T	A	T
Carbon monoxide	A	A(200°F)	T	A	T
Carbon tetrachloride	C	C	A(158°F)	C(122°F)	C
Castor oil	A(158°F)	A(158°F)	T	A	T
Chlorine gas, dry	B	B	A(212°F)	X	X
Chlorine gas, wet	C	B	T	X	X
Chloroacetic acid	A	A	T	X	T

CHEMICAL	NEOPRENE	HYPALON®	VITON®	ADIPRENE®	NORDEL®
Chlorobenzene	X	X	A	X	X
Chloroform	C	C	A	C	C
Chlorosulfonic acid	C	C	X	X	X
Chromic acid, 10-50%	C	A(158°F)	T	X	T
Citric acid solutions	A	A	T	T	T
Copper chloride solutions	A	A	T	A	T
Copper sulfate solutions	A	A	T	A	T
Cottonseed oil	A	A	A(300°F)	A	A-B
Creosote oil	C	C	A(212°F)	T	X
Cyclohexane	C	C	A	A	C
Dibutyl phthalate	C	C	B	C(158°F)	A
Diethyl sebacate	C	B	T	C	—
Dioctyl phthalate	C	B	T	C	T
DOWTHERM A	B	B	A(212°F)	B	—
DOWTHERM A	—	—	B(400°F)	—	—
Epichlorohydrin	—	T	C(122°F)	—	T
Ethyl acetate	C	C	C	C(122°F)	B
Ethyl alcohol	A(158°F)	A(200°F)	A	C	A
Ethyl chloride	B	B-C	T	C	X
Ethylene dichloride	C	C	B	C	X
Ethyl ether	C	C	C	—	X
Ethylene glycol	A(158°F)	A(200°F)	A(250°F)	B	A
Ethylene oxide	X	X	C(158°F)	T	X
Ferric chloride solutions	A	A(200°F)	T	T	T
Fluosilicic acid	A(158°F)	A(250°F)	T	T	T
Formaldehyde, 37%	T	A	A	X	T
Formaldehyde, 37%	—	C(158°F)	—	—	—
Formaldehyde, 40%	A	T	T	X	T
Formaldehyde, 40%	C(158°F)	—	—	—	—
Formic acid	A	A	C(158°F)	X	T
FREON-11®	A-B	A	A-B	B	X
FREON-11	B(130°F)	T(130°F)	T(130°F)	B(130°F)	—
FREON-12®	A	A	A-B	A	T
FREON-12	A(130°F)	A(130°F)	B(130°F)	A(130°F)	—
FREON-22®	A	A	C	C	X
FREON-22	A(130°F)	A(130°F)	X(130°F)	C(130°F)	—
FREON-113®	A	A	A	A	X
FREON-113	A(130°F)	A(130°F)	T(130°F)	T(130°F)	—
FREON-114®	A	A	A	T	X
FREON-114	T(130°F)	T(130°F)	—	T(130°F)	—
Fuel oil	A	A	T	B	X
Furfural	B	B	C(158°F)	C	T
Gasoline	B	B	A	B	B-C
Glue	A(158°F)	A(200°F)	T	A	T
Glycerin	A(158°F)	A(200°F)	A(250°F)	A	T
n-Hexane	A	A	A	B(122°F)	C
Hydraulic oils	A	A	A	B	—
Hydrochloric acid, 20%	A	A	A	B	T
Hydrochloric acid, 20%	—	A(158°F)	A(230°F)	—	—
Hydrochloric acid, 37%	A	A(122°F)	A(158°F)	X	A-B
Hydrochloric acid, 37%	—	B(158°F)	—	—	—
Hydrochloric acid, 37%	—	C(200°F)	—	—	—
Hydrocyanic acid	A	A	T	T	T
Hydrofluoric acid, 48%	A	A(158°F)	A	—	T
Hydrofluoric acid, 75%	T	T	B(158°F)	—	T

RATING KEY

A—Fluid has little or no effect
B—Fluid has minor to moderate effect
C—Fluid has severe effect
T—No data—likely to be compatible
X—No data—not likely to be compatible

Blanks indicate no evaluation has been attempted.

Unless otherwise noted, concentrations of aqueous solutions are saturated. All ratings are at room temperature unless specified.

CHEMICAL	NEOPRENE	HYPALON®	VITON®	ADIPRENE®	NORDEL®
Hydrofluoric acid, anhydrous	—	A	X	—	T
Hydrogen	A	A	T	A	T
Hydrogen peroxide, 88½%	B	A	T	T	T
Hydrogen peroxide, 90%	—	T	A	T	T
Hydrogen peroxide, 90%	—	—	C(270°F)	—	—
Hydrogen sulfide	A	A	T	T	T
Isooctane	A	A	A	B(158°F)	T
Isopropyl alcohol	A	A(200°F)	A	C	T
Isopropyl ether	C	B	T	B	X
JP-4	C	C	A(400°F)	C	C
JP-5	X	C	A(400°F)	C	—
JP-6	X	X	A(100°F)	X	—
JP-6	—	—	C(550°F)	—	—
Kerosene	B	B	A(158°F)	C	X
Kerosene	—	—	B(400°F)	—	—
Lacquer solvents	C	C	C	X	—
Lactic acid	A	A	T	T	T
Linseed oil	A	A	A	B	T
Lubricating oils	B(158°F)	B(158°F)	A(158°F)	B	X
Magnesium chloride solutions	A(158°F)	A(220°F)	T	A	T
Magnesium hydroxide solutions	A(158°F)	A(200°F)	T	A	T
Mercuric chloride solutions	A	A	T	—	T
Mercury	A	A	T	A	T
Methyl Alcohol	A(158°F)	A	B	C	T
Methyl ethyl ketone	X	X	C	C(122°F)	A
Methylene chloride	C(100°F)	C	B(100°F)	C	B
Mineral oil	A	A	T	A	X
Mixed acids	X	T	A(100°F)	C	T
Naphtha	C	C	A(158°F)	B	C
Naphthalene	C(176°F)	C(176°F)	T(176°F)	B	X
Nitric acid, 10%	B	A	A	C	T
Nitric acid, 30%	C	A	T	C	A
Nitric acid, 30%	—	C(158°F)	—	—	—
Nitric acid, 60%	X	B	A	C	T
Nitric acid, 70%	C	B	A	C	C
Nitric acid, 70%	—	—	B(100°F)	—	—
Nitric acid, red fuming	X	C	B	C	X
Nitric acid, red fuming	—	—	C(158°F)	—	—
Nitrobenzene	C	C	B	C	A
Oleic acid	B	B	T	B	T
Oleum, 20%	C	C	A	C	T
Oleum, 25%	C	C	A	C	T
Palmitic acid	B(158°F)	B	T	A	T
Perchloroethylene	X	C	A(212°F)	C	C
Phenol	B	B-C	A(212°F)	C	T
Phenol	—	—	B(300°F)	—	—
Phosphoric acid, 20%	T	A(200°F)	T	T	T
Phosphoric acid, 60%	A	A	A(212°F)	—	T
Phosphoric acid, 70%	T	A(200°F)	T	—	T
Phosphoric acid, 85%	A	A(200°F)	T	—	A

CHEMICAL	NEOPRENE	HYPALON®	VITON®	ADIPRENE®	NORDEL®
Pickling solution (20% nitric acid, 4% HF)	B-C	A	T	X	X
Pickling solution (17% nitric acid, 4% HF)	X	T	T	X	X
Pickling solution (17% nitric acid, 4% HF)	—	—	C(225°F)	—	—
Picric Acid	A	A	T	T	T
Potassium dichromate solutions	A	A(200°F)	T	T	T
Potassium hydroxide solutions	A(158°F)	A(200°F)	T	A	T
Pyridine	X	X	C	—	T
SAE #10 oil	C	C	T	A(158°F)	X
SKYDROL 500	X	X	C	C(122°F)	A(250°F)
Soap solutions	A(158°F)	A(200°F)	T	A	T
Sodium dichromate, 20%	B	A(200°F)	T	T	T
Sodium hydroxide, 20%	A	A(200°F)	A	T	A
Sodium hydroxide, 46½%	A	T	B	A	T
Sodium hydroxide, 46½%	A(158°F)	—	C(100°F)	—	—
Sodium hydroxide, 50%	A	A(285°F)	X	—	T
Sodium hydroxide, 73%	T	A(280°F)	X	—	T
Sodium hypochlorite, 5%	T	A	A	—	A
Sodium hypochlorite, 20%	B	A	B(158°F)	X	A
Sodium peroxide solutions	A	A	T	T	T
Soybean oil	A	A	A (250°F)	B	T
Stannic chloride	B	B	T	T	T
Stannous chloride, 15%	A(158°F)	A(200°F)	T	T	T
Steam (see water)	—	—	B(300°F)	—	A
Stearic acid	B(158°F)	B(158°F)	T	A	T
Sulfur, molten	A	A	A(250°F)	T	A
Sulfur dioxide, liquid	A	A	T	T	T
Sulfur dioxide, gas	A	A	T	—	T
Sulfur trioxide	C	C	T	T	T
Sulfuric acid, up to 50%	A(158°F)	A(250°F)	A	T	T
Sulfuric acid, 50 to 80%	B-C	A(158°F)	T	C	T
Sulfuric acid, 60%	B	A	A(250°F)	C	T
Sulfuric acid, 90%	X	T	A(100°F)	C	T
Sulfuric acid, 95%	C	A	A	C	C
Sulfuric acid, 95%	—	B(122°F)	A(158°F)	—	—
Sulfuric acid, fuming (20% oleum)	C	C	A	C	X
Sulfurous acid	X	A(158°F)	T	T	T
Tannic acid, 10%	A	A	T	A	T
Tartaric acid	A(158°F)	A(200°F)	T	A	T
Toluene	C	C	B(100°F)	C(122°F)	C
Tributyl phosphate	C	C	C(212°F)	C	X
Trichloroethylene	C	C	A	C	X
Trichloroethylene	—	—	B(158°F)	—	—
Tricresyl phosphate	X	C	A(300°F)	B	A(212°F)
Triethanolamine	A(158°F)	A(158°F)	X	T	A
Trisodium phosphate solutions	T	T	T	A	T
Tung oil	A	A	T	B	T
Turpentine	C	C	A(158°F)	C	C
Water	A(212°F)	A(212°F)	A(212°F)	A(122°F)	A(158°F)
Xylene	X	C	A	C	C
Xylene	—	—	B(158°F)	—	—
Zinc chloride solutions	A	A(200°F)	T	T	T

APPENDIX D-3
COATINGS FOR CWTP-5 AND CWTP-6

The following pages present data on the coatings used on curbs, sumps and floors at CWTP-5 and CWTP-6. Included are Ceilcote products:

Ceilgard Flake Prime 675
Ceilgard 630

CONCRETE SURFACE PREPARATION

AND

CONTAINMENT COATING APPLICATIONS

PREPARATION

- Open concrete floor surfaces were prepared by shotblasting. A "Blastrac" machine was used to perform shotblasting and vacuuming of the resulting concrete dust and shot.

- Concrete edges and corners were prepared using rotary sanding machine with very course sanding disks.

- Steel containment sumps were prepared by sandblasting.

- Floor joints, expansion joints and cracks were routed and filled with a chemical resistent caulking material. See Attachment A for a description of the caulking material.

COATING APPLICATION

- The initial coating functions as a primer/sealer. Ceilgard Flake prime 675 was the material used and it was applied to both steel and concrete surfaces using brushes or rollers. This coat was allowed to cure overnight prior to the finish coatings.

- A total of two finish coats (Ceilgard 630) were applied to both steel and concrete surfaces. The first coat, referred to as the "body coat", was fortified with silica aggregate to provide a non-skid surface. This was followed by a straight finish coat. Refer to Attachments B and C for manufacturer technical specifications for each coating.

- The primer coat is dark reddish brown and the finish coats are a light lime green. The two tone combination should be used to assess coating wear.

CONTRACTOR

DESCO Products of Connecticut, Inc.
P. O. Box 522
West Haven, CT 06516
(203)932-2271

s-s6h

ATTACHMENT A

SPEC DATA

This Spec-Data Sheet conforms to editorial style prescribed by The Construction Specifications Institute. The manufacturer is responsible for technical accuracy.

1. PRODUCT NAME

Bostik Chem-Calk® 500 Non-Sag or Chem-Calk® 550 Self-Leveling Traffic Grade Two-Component Polyurethane High Performance Elastomeric Joint Sealant

2. MANUFACTURER

Bostik Construction Products Division
Emhart Fastening Systems Group
P.O. Box 8
County Line & New Roads
Huntingdon Valley, PA 19006
Phone: (800) 523-6530
(215) 674-5600 (In PA)

3. PRODUCT DESCRIPTION

Chem-Calk® 500 non-sag or 550 self-leveling sealant is a two-component polyurethane sealant capable of dynamic joint movement totaling 50% of original joint geometry (±25%).

Basic Uses:

Chem-Calk® 500 non-sag sealant is designed for sealing expansion and control joints in precast concrete panels and metal curtain walls; perimeter sealing of door and window framing and other building components.

Chem-Calk® 500 polyurethane sealant may be factory-applied to seal shop finished products or field-applied to seal erected building components in both new and remedial applications.

Chem-Calk® 550 self-leveling polyurethane sealant is designed for sealing expansion, control and perimeter joints in parking decks, pavements, plazas, malls, patios, driveways, factory and institutional floors or any other areas subject to foot and light vehicle traffic.

The sealant cures to form a durable, flexible, watertight bond with most building materials in any combination: stone, masonry, ceramics, marble, wood, steel, aluminum, and many plastics. In many cases no primer is required.

Some substrates have variable surface characteristics depending on their source. The unpredictability of such surface characteristics makes it desirable to have a Pretested Adhesion to Substrates Test (PATS Program) on appropriate samples.

Application Limitations:

a) Chem-Calk® 500 or 550 sealant is not recommended for use in sealing submerged joints, particularly where porous surfaces permit water infiltration to bond surfaces.

b) Chem-Calk® 500 or 550 sealant is not recommended for exterior or interior structural sealing below the waterline in marine applications.

c) Chem-Calk® 500 or 550 sealant should not be applied with wet tooling techniques; using solvents, water or detergent/soap solutions is not recommended.

d) Chem-Calk® 500 or 550 sealant should not be applied to surfaces with special protective or cosmetic coatings without prior consultation of the manufacturer. Such surfaces include, but are not limited to, mirrors, reflective glass, or surfaces coated with Teflon™, polyethylene or polypropylene.

e) Chem-Calk® 500 or 550 sealant should not be applied to unpredictably absorptive surfaces such as marble, limestone or granite unless a standard of appearance has been agreed on as a result of testing for stain and/or discoloration.

f) Chem-Calk® 500 or 550 sealant cures by chemical means. The prepolymer system used can be affected by water before or during cure. The sealant should not be stored, applied or cured in areas where unusually high humidity or free water are present during the application or initial cure.

g) Chem-Calk® 500 non-sag sealant is not recommended for use in sealing horizontal decks, patios, driveway or terrace joints where abrasion or physical abuse is encountered. (Chem-Calk® 550 self-leveling is recommended for these applications.)

Food Status:

Chem-Calk® 500 or 550 has no food status. (See Chem-Calk® 1200 or Chem-Calk® 1000 Silicone Sealant, or Chem-Calk® 900 Polyurethane Sealant.)

Composition and Materials:

Chem-Calk® 500 or 550 polyurethane sealant has a smooth, creamy consistency that is easy to mix and gun. Its physical properties will remain stable over time and in severe weather conditions. Physical properties are relatively unchanged over a wide temperature range, -20°F to 150°F (-29°C to 66°C).

Priming may not be required for masonry, aluminum, steel and many common building materials (See Priming). If sealant is to be applied to a material with specially treated surfaces or of particularly unusual surface characteristics, consult Bostik for primer recommendation.

In all cases where doubt may exist, a sample should be tested. A trial installation placed on the actual project site is always recommended.

Packaging:

Chem-Calk® 500 or 550 polyurethane sealant is available as 1.5 gal. (5.68 liter) in a two gallon pail, with curing agent container and the appropriate color pack inside the pail. The packages are designed to be lightweight for easy transport to the job site.

Colors:

Chem-Calk® 500 or 550 is available in the following standard colors:

White	Stone
Limestone	Med. Bronze
Black	Tan
Antique White	Bronze

Chem-Calk® 500 or 550 may be custom matched to virtually any color using the Color Pack system. Chem-Calk® 500 non-sag uses Color Pack II; Chem-Calk® 550 self-leveling uses Color Pack III. **Color Pack II and III are not interchangeable;** each must be used with the appropiate sealant.

Color	CC500NS	CC550SL
Alum/Stone	#88 II	#88 III
Limestone	#58 II	#58 III
White	#75 II	#75 III
Stone	#92 II	#92 III
Mortar	#12 II	#12 III
Off White	#11 II	#11 III
Tan	#85 II	#85 III
Gray	#70 II	#70 III
Med. Bronze	#61 II	#61 III
Bronze	#64 II	#64 III

Applicable Standards:

Chem-Calk® 500 or 550 sealant meets or exceeds the test requirements of TT-S-227 (COM-NBS) for two-component sealants as Class A, Type I & II Non-Sag; and conforms to ASTM C920-79 Standard Specification for Elastomeric Joint Sealants as Type M, Grade SL/NS, Class 25, Use T/NT, G, A and M; Canadian Specification 19-GP-24.

4. TECHNICAL DATA

Chem-Calk® 500 or 550 polyurethane sealant is virtually unaffected by normal weathering conditions such as rain, sunlight, snow, sleet, ultraviolet radiation, ozone, atmospheric contamination and pollution. Its excellent weatherability enables it to retain its original properties after years of exposure.

Joints formed with Chem-Calk® 500 or 550 sealant can be expected to extend and compress a total of 50% of the installation width with no more than 25% movement in a single direction without affecting the seal or adhesive bond. See Table 1. Typical adhesion values for common construction surfaces are in Table 2.

TABLE 1: CHEM-CALK® 500/550 — TYPICAL PROPERTIES*
(after 7 days cure at 77°F and 50% R H)

Property	Value	Test Method
Hardness (A Scale)	35	ASTM D 2240
Modulus @100%	75 ppi	ASTM D 412
Tensile Strength	230 psi	ASTM D 412
Adhesion in Peel	>12 ppi	ASTM C 794
Stain and Color Change	None	ASTM C 510
Ozone Resistance	Excellent	
Joint Movement Capability	±25%	ASTM C 719
UV Resistance	Good	ASTM C 793

*Values given above are not intended to be used in specification preparation.

**TABLE 2:
CHEM-CALK® 500/550 — ASTM C 794 ADHESION IN PEEL TO COMMON CONSTRUCTION SURFACES***

Surface	Pounds Per Inch	Failure Type and %
Ceramic Tile	18	Cohesive — 100
Concrete**	16	Cohesive — 50
Brick	16	Cohesive — 50
Granite	12	Cohesive — 10
Marble**	10	Adhesive — 100
Limestone	16	Cohesive — 50
Mill Finished Aluminum	12	Cohesive — 10
Anodized Aluminum	12	Cohesive — 10
Steel	10	Adhesive — 100
Galvanized Steel	10	Adhesive — 100
Stainless Steel**	4	Adhesive — 100
Fiberglas	10	Adhesive — 100
Rigid PVC**	5	Adhesive — 100
Plywood	18	Cohesive — 100

*Values given above are not intended for use in specification preparation.
**With primer, value is >18, Cohesive — 100.

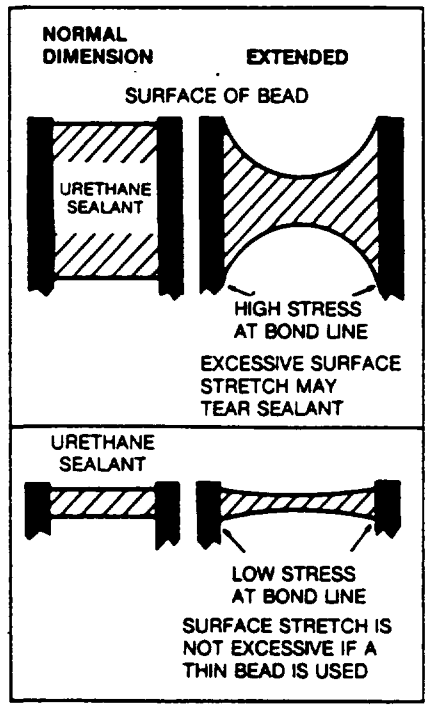
5. INSTALLATION

Joint Design:

More joint movement can be accommodated in a thin bead of sealant than in a thick bead. Chem-Calk® 500 or 550 polyurethane sealant should be no thicker than ½" (12.7 mm) and no thinner than ¼" (6.4 mm). The ratio of joint width to sealant depth should be approximately 2:1 for joint width of greater than ½" but less than or equal to 1" (25.4 mm).

Principles of Joint Design: *Figure 1* illustrates why a thin bead of sealant will accommodate more movement than a thick bead. Obviously, the thin bead is the most desirable. Sealants usually need be no thicker than ½" (12.7 mm) and no thinner than ¼" (6.4 mm). *Figure 2* illustrates a second critical principle. The use of a bond breaker prevents undesirable three-sided adhesion.

**FIGURE 1
DESIGN**



Polyurethane (e.g. Denver Foam™) or polyethylene foam rod is the recommended back-up material for deep joints; polyethylene tape for joints too shallow to allow foam rod. These materials allow a bead of sealant to be applied and obtain two-sided adhesion, which will maximize a sealant's extension and compression capability. *See Figures 3 and 4.*

FIGURE 2
BOND BREAKER

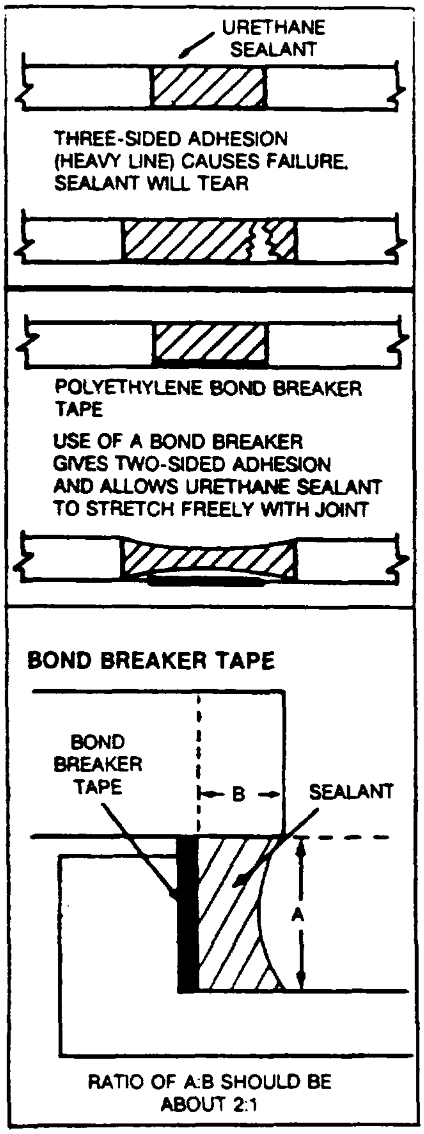
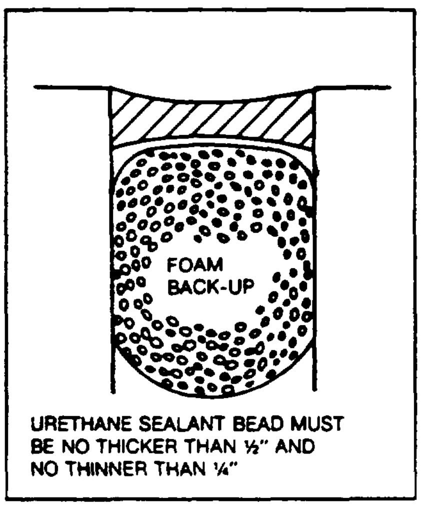


FIGURE 3
TYPICAL JOINT DETAIL



Under certain conditions, the use closed cell type back-up materials can result in bubble formation and deformation in the surface of the sealant bead. This usually does not affect the performance of the sealant, but can be unattractive. The use of open cell back-up materials minimizes this condition.

In remedial work where it is impossible to remove old, failed sealant and restore the surfaces to a like-new condition, the band-aid approach may be utilized. A bond breaker tape is applied to bridge over the existing joint and old sealant so that the tape extends beyond the edges of the original joint. This also has the effect of increasing the joint width and decreasing the percentage movement that the sealant must accommodate. The technique is also useful in new construction where the designed width is determined to be inadequate for the actual movement. *See Figure 5.*

FIGURE 4
TYPICAL JOINT DETAILS

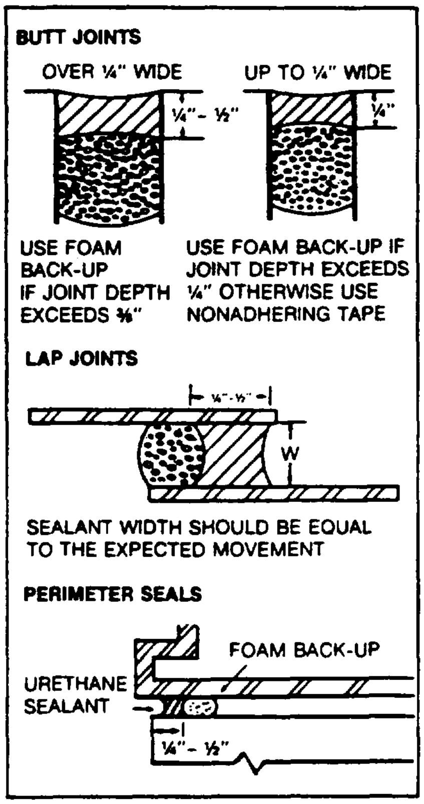
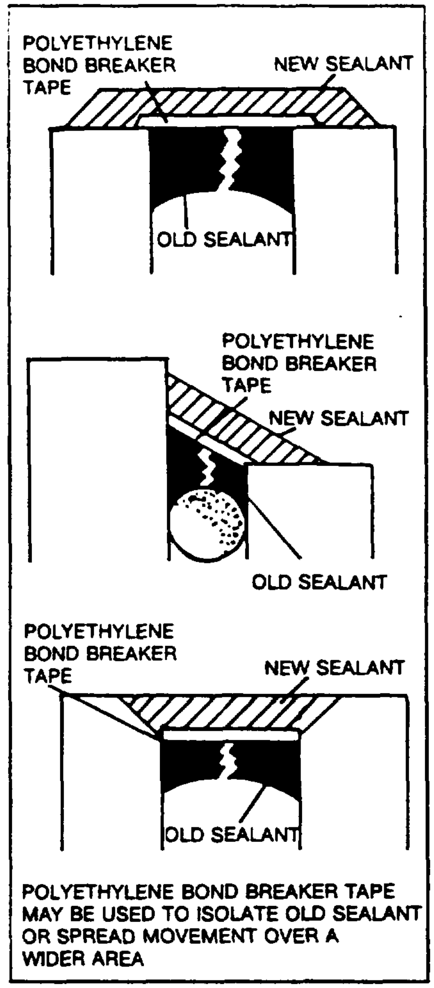
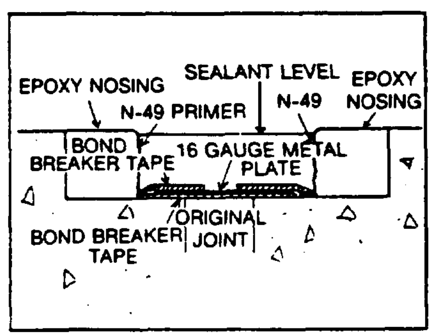


FIGURE 5
BAND-AID METHOD



The "T" joint is a recommended remedial method for use in horizontal joints that have the Chem-Calk® 550 self-leveling grade installed. Many times horizontal joints are encountered that place too much strain on the sealant for a successful long-term installation. In such cases the remedy, whether performed at the time of the original installation or as a part of the remedial work, is one of increasing the joint width until the yearly movement is 20-25% of the total joint width. See Table 3 for the recommended joint widths for various length spans of concrete.

FIG. 6 "T" JOINT



The step by step procedure for properly installing a "T" joint in concrete construction is:

1. The "T" joint should be sawed or preformed as illustrated in concrete that is fully cured, dry and sound.
2. The edges of the concrete should be sandblasted and blown clean to provide a sound concrete surface to which to bond a sand filled epoxy nosing.
3. Apply an excellent quality sand filled epoxy to form an epoxy nose. Bevel the edge of the joint as shown to eliminate spalling of the sharp corner under traffic. Allow the epoxy to thoroughly cure according to the manufacturer's recommendation.
4. Sandblast the epoxy nosing and blow clean.
5. Apply Chem-Calk® Bond-Breaker Tape as shown.
6. Apply 16 gauge stainless or aluminum plate in joints exceeding 2" (51 mm) wide. The plate should be 75% of the width of the joint. Again apply two strips of Chem-Calk® Bond-Breaker Tape as shown on top of the plate allowing a break in the center equal to 25% of the width or 1/2" (12.7 mm) maximum to allow the sealant to bond.

   Prime the epoxy nosing with Bostik CPD's N-49 Primer, allowing it to dry to the touch.

8. Mix the Chem-Calk® 550 according to the instructions and pour into the joint to a level 1/8" (3.2 mm) below the surface of the top of the joint. Allow the Chem-Calk® 550 to completely cure before exposing to traffic.

The longevity of on or below grade sealant installations subject to traffic or extended water immersion conditions will be less than those exposed to no traffic, intermittent water immersion or similar above grade installations.

Joint Dimensions:

The width of building expansion joints vary due to seasonal and daily changes in temperature. Chem-Calk® 500 or 550 polyurethane sealant should be installed when the design width is approximately halfway between the dimensional extremes, typically at 65°F to 80°F.

Joint width should not be less than ¼" (6.4 mm). The joint depth must allow a sealant depth, after installation of bond breaker material, of a minimum of ¼" (6.4 mm). Lap shear joints should have a bead width equal to, or greater than twice the anticipated movement.

TABLE 3: Recommended Joint Widths for Concrete Spans

Joint Spacing	Total Joint Movement 150° Temp. Change	Minimum Opening at Median Temperature Precast/Poured in Place	Minimum Opening at Median Temperature Post-Tensioned
Feet	**Inches**	**Inches**	**Inches**
35	0.18	1.4	1.75
45	0.25	1.8	2.25
55	0.33	2.2	2.75
65	0.40	2.6	3.25
75	0.47	3.0	3.75
85	0.54	3.4	4.25
95	0.61	3.8	4.75

APPROX. LINEAR FEET PER 1½ GALLON UNIT

Depth, Inches	Width, Inches ⅛"	¼"	⅜"	½"	⅝"	¾"	⅞"	1"
⅛"	1848	924	615	462	369	308	264	231
¼"		412	308	231	185	153	132	116
⅜"			204	153	123	102	87	77
½"				116	92	77	66	57

Sma[illegible]tainwall panels should allow a minimum width of ¼" (6.4 mm) for the sealant bead. Sealing of panels fabricated from plastic requires larger than usual joint dimensions due to plastic's higher co-efficient of thermal expansion.

A conservative design practice, which uses a portion of the sealant's movement capability as a safety factor is recommended. Sealants are subject to cohesive failure when the actual movement is greater than their rated capability. Also, sealants applied under conditions resulting in less than optimum adhesion to the joint surfaces may fail adhesively within the limits of their rated capability. For all applications requiring a high degree of dynamic movement the designed joint width should be at least four times the total anticipated joint movement.

Preparatory Work:

Clean all joints by removing foreign matter and contaminants such as oil, dust, grease, frost, water, surface dirt, old sealants and any protective coating.

Porous substrates should be cleaned as necessary by grinding, saw cutting, blast cleaning (sand or water), mechanical abrading or a combination of these methods that will be required to provide a sound, clean and dry surface for sealant application. Dust, loose particles, etc., should be blown out of joints with oil-free compressed air or vacuum cleaned.

Non-porous and plastic surfaces should be cleaned by a solvent procedure or by mechanical means.

Detergent or soap and water cleaning treatments are not recommended. Protective films must be removed by a solvent recommended by the manufacturer of the component or other means that leave no residue. In all cases where used, solvents should be applied with one clean cloth or lintless paper towel and the solvent wiped clean with a second cloth or towel. Cleaning solvents should not be allowed to air dry or evaporate without being wiped. Architectural coatings, paints and plastics should be cleaned with a solvent approved by the manufacturer of that product.

Cleaning of all surfaces should be done on the same day in which the sealant is applied. CAUTION! SOLVENTS MAY BE FLAMMABLE AND ARE TOXIC.

Priming:

Chem-Calk® 500 non-sag polyurethane weather proofing sealant generally does not require priming except that joints subjected to intermittent water immersion should be primed with N-49 primer. Chem-Calk® 550 self-leveling sealant requires N-49 primer on concrete or N-40 primer on most metals. Joints must be thoroughly dry before applying primer and sealant. If sealant is to be ied to a material with specially treated surfaces or of particularly unusual surface characteristics, consult Bostik for primer recommendations. Prior to any use, however, it is always recommended that a bead of sealant be applied on the surface to test adhesion. See Pretested Adhesion to Substrates Program.

Masking:

Masking should be done after priming to avoid wicking primer under tape applied on rough surfaces or tape that is not tightly adhered to the surface.

All areas adjacent to joints can be masked to assure a neat appearance. The masking tape should not be allowed to touch the clean surfaces to which the sealant is to adhere. Soon after sealant application and before a skin forms, tooling should be completed in one continuous stroke. **Remove masking tape immediately after tooling is completed.**

Mixing:

Chem-Calk® 500 or 550 is a multi-part sealant, provided as base, activator (or curing agent) and color pack. All the accelerator and appropriate color pack must be thoroughly mixed with the base to avoid uncured areas and/or color streaks. Failure to follow mixing instructions implicitly can result in spotty cure, random cure or complete lack of cure of the sealant. Do not attempt to mix partial units, as the exact ratio of curing agent to base is essential for optimum performance.

Mixing Instructions:

1. Remove the cover from the metal container. Remove the zip-top lid from the activator can and add the entire contents, scraping out all residue in the can. Add the entire contents of the accompanying Color Pack II or III.
2. Five minutes of thorough mixing is required to obtain optimum cure. Due to the critical nature of the mix, Bostik recommends the use of either a #230 Prop Mixer or the Bostik CPD #1 Mixing Paddle. Mix with a slow speed (80-150 rpm) drill, using either of the recommended mixing paddles for a full five minutes by the watch. Five minutes minimum are required to properly blend the color and activator into the sealant base. Use a timer to time your mixing. The color paste should all be blended into the sealant with no streaks. The material is improperly mixed if it is not uniform in color.
3. Stop at least once during mixing and scrape the bottom and sides of the container as well as the blades of the mixing paddle. Failure to follow mixing instructions implicitly can result in spotty cure, random cure or complete lack of cure.

The mixed sealant will have a three (3) hour to five (5) hour application/tooling time depending on temperature. Temperature has a direct bearing on the work life and cure rate of chemically curing sealants. High temperatures result in a shortened work life and cure rate, while low temperatures extend both.

Bulk caulking guns are used to install the sealant into the joints to be caulked. The mixed sealant may be drawn up into the bulk gun by inserting it into a follower plate and drawing the piston or using a spatula to load the gun. Special nozzle tips are available to dispense the sealant.

Method of Application:

Install back-up material or joint filler as specified. Apply Chem-Calk® 500 polyurethane sealant in a continuous operation using a positive pressure adequate to properly fill and seal the joint. Tool the non-sag grade sealant with adequate pressure to spread the sealant against the back-up material and onto the joint surfaces. A tool with a concave profile is recommended to keep the sealant within the joint.

The Chem-Calk® 550 self-leveling grade is pourable and seeks its own level. Tooling is usually not necessary. The self-leveling sealant should not be used in joints with more than a two degree slope. Also, check one-half hour or so after the sealant has been applied to be sure that no runout has taken place through voids in the bottom of the joint. Such an occurrence is easily repaired at this time by topping with new material.

Excess sealant should be dry-wiped from all surfaces while still uncured, following with a commercial solvent such as xylol, toluol, or methyl ethyl ketone. Should sealant accidentally begin to cure on adjacent porous surfaces, the excess sealant should be allowed to progress through *the initial cure or set-up*. It should be removed promptly by abrasion or other mechanical means.

CURED SEALANT IS USUALLY VERY DIFFICULT TO REMOVE WITHOUT ALTERING OR DAMAGING THE SURFACE TO WHICH THE SEALANT HAS BEEN MISAPPLIED.

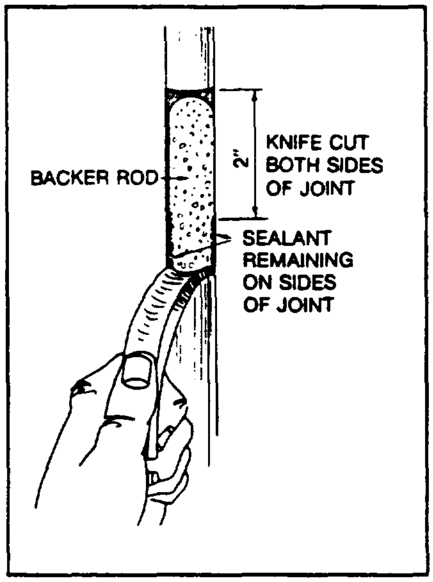
Field Adhesion Test:

A hand pull test may be run on the job site after the sealant is fully cured. (Usually within 7 to 21 days)

The hand pull test procedure is as follows:

1. Make a knife cut horizontally from one side of the joint to the other.
2. Make two vertical cuts approximately two inches long, at the sides of the joint, meeting the horizontal cut at the top of the two inch cuts.
3. Grasp the two inch piece of sealant firmly between the fingers and pull down at a 90° angle or more, and try to pull the uncut sealant out of the joint.
4. If adhesion is proper, the sealant should tear cohesively in itself or be difficult to adhesively remove from the surface.
5. Sealant may be replaced by applying more sealant in the same manner it was originally installed. Care should be taken to assure that the new sealant is in contact with the original, and that the original sealant surfaces are clean, so that good bond between the new and old sealant will be obtained.

FIELD ADHESION TEST



Precaution:

On contact, uncured sealant causes irritation. Avoid contact with eyes and skin. Contact lens wearers take appropriate precautions. IN CASE OF CONTACT, FLUSH EYES WITH WATER. CALL A PHYSICIAN. Remove from skin with dry cloth or paper towel. KEEP OUT OF REACH OF CHILDREN. Chem-Calk® 500 or 550 is manufactured for industrial use only.

6. AVAILABILITY AND COST

Chem-Calk® 500 or 550 polyurethane sealant is available throughout the United States through distributors. For the name of your nearest distributor contact Bostik at 800-523-6530 (in PA, 215-674-5600).

Shelf Life:

When stored at or below 80°F (27°C), Chem-Calk® 500 or 550 polyurethane weatherproofing sealant has a shelf life of twelve months from date of shipment from Bostik's warehouse facilities.

7. WARRANTY

Limited Warranty:

Your purchase and use of this product is subject to Bostik's standard terms and conditions of sale. Bostik's sole liability in the event of a product defect is to replace this product or return its purchase price. Under no circumstances will Bostik be liable for consequential or incidental damages of any type.

ALL OTHER WARRANTIES WHETHER EXPRESS OR IMPLIED, INCLUDING WITHOUT LIMITATION, ANY WARRANTY OF MERCHANTABILITY OR FITNESS OF PURPOSE ARE EXPRESSLY DISCLAIMED.

8. MAINTENANCE

No maintenance should be needed. If sealant becomes damaged, replace damaged portion. Clean surfaces in damaged area, and repair with fresh Chem-Calk® 500 or 550 sealant.

TECHNICAL SERVICES

Complete technical information and literature is available from Bostik. Any technical advice furnished by the Company or any representative of the Company concerning any use or application of any sealant is believed to be reliable, but the Company makes no warranty, express or implied, of any use or application for which such advice is furnished.

Pretested Adhesion to Substrates (PATS) Program

The program is intended to eliminate potential field problems by pretesting Bostik's construction sealants with samples of building materials on which the sealant will be applied. The tests will aid in determining the proper surface preparation method, effective solvents for cleaning and whether priming is necessary to achieve optimum adhesion. Following this procedure will remove many of the unknown variables that affect field success.

Test samples or coupons should be identified as to manufacturer, origin, designed use, building project, person and firm originating the request. Appropriate sketches or drawings showing the intended use can be helpful.

Materials submitted for testing should be sent

Att: Technical Service Manager
Bostik Construction Products Division
P.O. Box 8
County Line and New Roads
Huntingdon Valley, PA 19006

10. FILING SYSTEMS

SPEC-DATA® II

Sweets Catalogs Section 7.11

Complete technical literature is available on request. Contact Bostik for specific bulletins.

DESCO PRODUCTS OF CONN., INC.
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TEL. (203) 932-2271

Bostik
CONSTRUCTION PRODUCTS DIVISION

EMHART

11-86-1389A

ATTACHMENT B

CeilGard
Corrosion Coatings

Technical Bulletin
CG-675
May, 1987
Supersedes April, 1985

CeilGard Flakeprime® 675 (Formerly CeilGard 675) Catalyzed Epoxy Primer

Product Description

Most advanced of epoxy primers, CeilGard Flakeprime 675 is a two component product which combines the layering of micro-thin flake pigments with a unique resin/cure process. Thus it not only provides exceptional resistance to rust, chemical corrosion and resistance to undercutting, but also has the ability to cure at low temperatures and over damp surfaces.

CeilGard Flakeprime 675 utilizes an advanced rust inhibiting system which does not rely solely upon the gradual deterioration of soluble pigments to prevent rust formation. Under highly corrosive conditions the primer retains its inhibitive properties much longer, resulting in improved corrosion resistance and longer service life.

Recommended Uses

Prime coat on steel or concrete surfaces. Although generally recommended for sandblasted surfaces, CeilGard's exceptional moisture tolerance permits its use over waterblasted or wet sandblasted surfaces. (Consult CeilGard technical representative.)

Use in Conjunction With

Prime coat for CeilGard Flakeprime 600 Epoxy Topcoat, optional prime coat for CeilGard Flaketar 661 Coal Tar Epoxy.

Generic Type

Catalyzed, rust inhibitive epoxy primer.

Surface

Applied over properly prepared masonry and steel substrates.

Resistance

Highly resistant to alkalies or solvents, equivalent to the best amine or polyamide primers. Superior to other epoxies in resistance to inorganic acids in water, and can be considered equivalent to vinyls in acid fumes, spillage, or water immersion environments. It is equivalent to amine cured epoxies in resistance to organic acids.

Color

Red and Gray.

Weight per gallon

10.7 ± 0.2 lbs. (mixed).

Solids Content

73% by volume, 82% by weight.

Viscosity

300 ± 50 cps @ 77°F.

Flash Point

Component "A" - 65°F. (18°C.). Component "B" - 130°F. (54°C.) (Pensky-Martens Closed Cup).

Shelf Life

Six months at temperatures below 90°F.

Pot Life

@25°F. - 12 hrs.; @50°F. - 8 hrs.; @70°F. - 3 hrs.; @90°F. - 2 hrs.

Temperature Resistance

350°F. continuous dry; wet varies depending upon topcoat.

Surface Preparation

Steel — For immersion or direct spillage use a "White Metal" sandblast in accordance with Steel Structures Painting Council Specification SP-5-63 or NACE Specification #1. For non-immersion a "Commercial" sandblast in accordance with SP-6-63 or NACE #3 is acceptable if cleaning is maintained in strict accordance with these specifications. Profile depth should be 1.0 - 2.0 mils. Can be applied over hand cleaned surface but reduced performance will result.

Concrete — Sandblast to provide a clean, sound dry surface or acid etch with a solution of 1 part hydrochloric acid to 2-3 parts of water solution. Flush with water and allow to dry thoroughly. Concrete must be thoroughly cured (minimum 14 days) before preparing surface. All laitance, dust, curing or release agents must be removed during surface preparation.

The Ceilcote Company, Inc., CeilGard Corrosion Coatings
P.O. Box 40529 / Houston, TX 77240 / 7100 Wright Road / Houston, TX 77041 713-466-6701
140 Sheldon Road / Berea, OH 44017 216-243-0700
7065 Fir Tree Drive / Mississauga, Ontario / Canada L5S 1G7 / 416-671-1790

CEILCOTE

Application	*Su... le for spray application at temperatures ... ow 20° F.* and will cure properly at temperatures as low as 10° F. *Precautions: Maintain adequate ventilation and avoid application over frosted surfaces or ice.*
	CeilGard Flakeprime 675 will bond to damp concrete surfaces after acid etching or to concrete containing residual moisture as long as the surface is not visibly wet or hydrostatic pressure is not present. On moist surfaces apply with brush or roller to insure optimum adhesion.
Number of Coats and Thickness	One coat at 2.0 - 3.0 dry mils. *Three wet mils will yield 2.5 dry mils.*
Coverage	Theoretical coverage is 1171 sq. ft./gal. @ 1 mil DFT. Concrete surfaces will average about 250 sq. ft./gal. depending upon surface texture and actual film thickness.
Thinning	If needed, add up to 2 oz. per gal. of Solvent T-470 at temperatures between 20-70° F. Use up to 2 oz. per gal. of Solvent T-460 at temperatures above 70° F.

Recoat & Curing Time

	To Recoat	Cure Time
@25° F.	12-18 hrs.	96 hrs.
@50° F.	6-8 hrs.	36 hrs.
@70° F.	3 hrs.	12 hrs.
@90° F.	1 hr.	8 hrs.

For immersion service, topcoating should be done within 30 days. For atmospheric service topcoating should be done within 120 days.

Mixing

Mix Hardener Component "B" into Resin Component "A" using mechanical agitation to assure complete mixing. Material will become thinner when mixed. *Observe pot life limitations.*

Application Equipment

Brush or roller applications are particularly recommended for concrete — use a short nap roller, working material into surface, or use medium stiff natural bristle brush.

Conventional Spray — Use 3/8 I.D. fluid hose of 75 ft. maximum length. Use Binks #66 fluid tip and needle, 63 PJ or 63 PB air caps, or equivalents from other manufacturers.

Airless Spray — Use a minimum of 23:1 ratio pump and 60-100 mesh filter. Use tungsten carbide fluid orifice sizes of .015 - .023, with 25-70° angles.

Clean-Up

Use CeilGard T-410 Solvent, methyl ethyl ketone or lacquer thinner.

Packaging

Available in 1 gal. and 5 gal. units.

Storage

Store in a cool, dry place away from fire hazards.

Safety

CeilGard Flakeprime 675 contains epoxy resins, polyamide catalyst and aromatic solvent. The product's components have been formulated to optimize physical characteristics such as abrasion, moisture and chemical resistance while minimizing hazardous physical and health factors encountered during application. A concerned effort is made to be aware of the latest chemical toxicological information and to apply this knowledge in a responsible manner to insure product safety.

During application of CeilGard Flakeprime 675 materials always wear gloves and appropriate work clothing to minimize contact. Ventilation is required with special consideration for enclosed or confined area. Air movement must be designed to insure turnover at all locations in work area and adjacent areas to avoid buildup of heavy vapors. Use caution when handling flammable liquids, eliminate sources of ignition from work area, and containers with residues.

Observe safe storage practices by separating resins from hardeners, by keeping solvents in a cool area free of sources of ignitions.

Product Material Safety Data Sheets and Installation Bulletins are available and should be consulted when handling products. These products are for industrial and professional use only; application directions must be followed.

A[T]TACHMENT C

CeilGard
Corrosion Coatings

Technical Bulletin
CG-630
May, 1987

CeilGard 630 Series
Epoxy-Phenolic Lining

Product Description	Two component Epoxy-Phenolic lining system designed for severe chemical exposures and tank lining service.
Recommended Uses	Superior tank lining systems suitable for petroleum products, chemicals, water, caustic and solvent service.
Use in Conjunction With	Self-priming two coat system.
Generic Type	Cross linked, flake filled, Epoxy-Phenolic.
Surface	Apply to clean, abrasive blasted surfaces.
Resistance	Resistant to petroleum/petrochemical products, chemicals, fresh and salt water.
Color	Green, Light Gray and off-white colors only.
Solid Content	62% + 2% by volume.
V.O.C.	2.7 lbs./gallon mixed.
Flash Point	61°F. (16°C.) mixed, Tag Closed Cup.
Shelf Life	18 months at 70°F.
Pot Life	3-4 hours at @ 77°F., 1 hour @ 95°F.
Temperature Resistance	170°F. (77°C.) immersion, 300°F. (149°C.) atmospheric.
Surface Preparation	*Steel:* Immersion and other severe service: white metal SSPC-SP-5 or NACE #1 with a 2.0 mil surface profile. *Concrete:* Lightly blast or acid etch the surface. If acid etched, the surface must be rinsed with fresh water and allowed to dry thoroughly.
Application	Spray preferred. Can be brushed on small areas.
Number of Coats and Thickness	Apply 10-12 wet mils (6-7 dry) in one multi-pass spray coat. Apply two coats of contrasting colors for a total DFT of 12-15 mils.
Coverage, Theoretical	960 sq. feet/gallon @ 1 mil, 160 sq. ft. @ 6 mil. DFT.
Thinning	As required, use CeilGard T-8305 Thinner.

Recoat & Curing Time

Metal Temp.	Recoat Times Min.	Recoat Times Max.	Cure Times
55-70°F.	24 hr.	72 hr.	5-6 days
71-95°F.	8 hr.	48 hr.	3-4 days
96-120°F.	6 hr.	30 hr.	1½ days

Note: Force curing at 120-180°F. for 48-72 hours will increase resistance to certain exposures.

Mixing — Mix part A with mechanical agitation and add part B catalyst while mixing. OBSERVE pot life limitations. For less than full units, mix A and B at 24:1 by volume.

The Ceilcote Company, CeilGard Corrosion Coatings
P.O. Box 40529 / Houston, TX 77240 / 7100 Wright Road / Houston, TX 77041 713-466-6701
140 Sheldon Road / Berea, OH 44017 216-243-0700

CEILCOTE

Application Equipment	All spray equipment should be clean and dry. *Airless:* Pump ratio (min.) 30:1 Atomization pressure 2600-3000 psi Tip size .019-.027 *Conventional:* Standard production type spray guns. Material hose I.D. ½ in. Material hose length (max.) 50 ft. Air hose I.D. 5/16 in. Atomization pressure 70-100 psi Fluid tip (in.) .086
Clean-Up	Use CeilGard T-410 or methyl ethyl ketone.
Packaging	Available in 1 and 5 gallon units.
Storage	Store in a cool, dry place away from fire hazards.
Safety	CeilGard Epoxy-Phenolic coatings contain epoxy and phenolic resins and alkaline curing agents, solvents and pigments. During application of these products always wear gloves and appropriate work clothing to minimize contact. Ventilation is required with special consideration for enclosed or confined areas. Approved respirator may be required if "TLV's" are exceeded. Air movement must be designed to insure turnover at all locations in work area and adjacent areas to avoid build-up of heavy vapors. Use caution when handling flammable liquids, eliminate all sources of ignition from work area. Avoid prolonged contact with skin and breathing of vapor or spray mist. Product Material Safety Material Data Sheets are available and should be consulted when handling products. These products are for industrial and professional use only and application directions must be followed.

7.5M 5/87 CR

APPENDIX D

Designation	Title	Content
D-4	Underground Tank Purchase	Specifications for buried tanks of CWTP-3

DIVISION 15 - MECHANICAL

SECTION 15550 - STORAGE TANKS - STEEL

1. GENERAL

1.01 SCOPE

A. The following documents apply to the products specified in this Section:

1. Drawing No. PE-M-5460-E, sheets 1 and 2.

B. The work of this section includes all labor, materials and services required to furnish to United 24 double wall underground storage tanks with 360° wrap as specified herein, including:

1. Design, fabricate, inspect and test the tanks to meet all applicable regulations, standards,codes, conditions, loads and other requirements specified herein.

2. Apply coatings to the tanks in accordance with:

a. STI-P3 exterior coating for all tanks and interior coating of two tanks for Base Bid.

b. Fiberglass exterior cladding for Bid Alternate No. 1 (in lieu of STI-P3).

c. Internal coating of selected additional tanks for Bid Alternate 2.

3. Provide cathodic protection for the tanks as specified.

4. Transport the tanks to the United site in East Hartford, CT

5. Prepare the delivery site for temporary storage of the tanks before installation in accordance with approved shop drawings and instructions.

6. Unload the tanks and place them in temporary storage.

7. Inspect the tanks during the unloading procedure.

8. Provide field service for the installation of the tanks asj specified.

9. Provide specified spare parts and coating materials for field repairs.

C. Work to be performed by United or by others under separate contract with United:

1. Acceptance testing.

2. Transportation of tanks from temporary storage to the installation site.

3. Installation of tanks; installation of piping to the limits shown on drawings and installation of all pumps, instrumentation and auxiliary equipment.

1.02 QUALITY ASSURANCE

A. The manufacturer of the tanks shall be regularly engaged in the manufacturing of underground double-wall steel storage tanks with protective coatings and fitted for cathodic protection systems.

B. The manufacturer shall conduct the following tests and inspections as specified herein:

   1. Leak tests of inner and outer tanks.

   2. Spark tests of linings and/or coatings

   3. Visual inspections

   4. Conduct of Inspections and Tests:

      a. The responsibility for inspection and tests rests with the manufacturer. However, United reserves the right for its authorized representative to inspect the tanks at any time during the fabrication to assure that tanks, materials and workmanship are in accordance with this specification.

      b. The manufacturer shall notify United when tank fabrication is started, when the tanks are being tested and when the tanks are being completed for final inspection before shipment. The release of the tanks by the inspector shall not relieve the manufacturer of his responsibility nor alter the condition of the warrantee.

C. The manufacturer shall warranty tanks for a period of 30 years. The warranty period for each tank shall begin on the date of certification by the manufacturer that the tank has been properly placed in storage.

D. The manufacturer shall comply with the following standards, unless otherwise specified. All codes, standards, and specifications, shall be the latest published revisions of such references in effect at time of Purchase Order.

1. American National Standards Institute (ANSI):

   a. ANSI B16.5 "Steel Pipe Flanges and Flanged Fittings".

2. American Society for Testing and Materials (ASTM):

   a. A53 Pipe, Steel, Black and Hot-Dipped, Zinc-coated, Welded and seamless.

   b. A105 Screwed Fittings and Forgings.

   c. A106 Seamless Carbon Steel Pipe for High Temperature Service.

   d. A283 Low and Intermediate Tensile Strength Carbon Steel Plates of Structural Quality.

   e. A285 Pressure Vessel Plates, Carbon Steel Low and Intermediate Tensile Strength.

3. American Petroleum Institute (API):

   a. "Welded Steel Tanks For Oil Storage" API 650.

   b. "Installation of Underground Petroleum Storage Systems", API 1615.

4. American Society of Mechanical Engineers (ASME):

   a. ASME Code, Section VIII, Div. 1, "Unfired Pressure Vessels."

   b. ASME Code, Section IX, "Qualification Standard for Welding and Brazing."

5. National Association of Corrosion Engineers (NACE):

   a. "Control of External Corrosion on Metallic Buried, Partially Buried, or Submerged Liquid Storage Systems", NACE RP-02-85.

6. National Fire Protection Association (NFPA):

   a. "Flammable and Combustible Liquids Code," NFPA No. 30.

7. Petroleum Equipment Institute (PEI):

   a. "Recommended Practices for Installation of Underground Liquid Storage Systems", PEI/RP100-86".

8. Steel Tank Institute (STI):

   a. "Reliable, Low-Cost, Long-Life Design in Underground Steel Storage Tanks", Publication 15.8(d).

   b. "Specification for STI-P3 System of External Corrosion Protection of Underground Steel Storage Tanks".

   c. "Standard For STI '86 Containment System".

9. Underwriters Laboratories (UL):

   a. "Steel Underground Tanks for Flammable and Combustible Liquids", UL 58 (NOTE: INCLUDES PROPOSED REVISIONS DATED APRIL 17, 1987 AND TITLED "APPENDIX A").

   b. "Corrosion Protection Systems for Underground Storage Tanks", UL 1746.

E. The manufacturer shall have a quality assurance program for welding quality which is equal to that required for aboveground steel tanks as described in API 650, Section 7 "Welding Procedure and Welder Qualifications." All related records shall be subject to review by United at the manufacturer's facility.

1.03 <u>REGULATORY COMPLIANCE</u>

A. The manufacturer shall fabricate the tanks in compliance with all applicable federal and State of Connecticut laws, codes and regulations governing tanks of the type specified.Wherever the provisions of these regulations and this specification differ, the more stringent provision shall apply. These applicable regulations include but are not limited to:

   1. Proposed federal regulation 40 CFR Part 280 "Technical Standards and Corrective Action Requirements for Owners and Operators of Underground Storage Tanks", subparts A and B.

   2. State of Connecticut Regulation Section 22a-449(d)-1 "Control of the Nonresidential Underground Storage and Handling of Oil and Petroleum Liquids."

B. The installation and maintenance instructions shall also comply with these regulations.

1.04 SUBMITTALS

A. SHOP DRAWINGS:

1. Shop drawings shall be submitted in accordance with the Project Schedule (Para. 1.06 below). They shall be submitted to the United representative designated in paragraph 1.07.

2. A minimum of six copies of shop drawings shall be submitted to United. Five copies will be retained by United and Engineer, and one copy with action noted will be returned to tank supplier. If supplier requires more than one copy of annotated shop drawings, additional copies must be submitted.

3. All shop drawings must include the following information:

   a. Title reading:

      "Underground Tanks - Pratt & Whitney - East Hartford, CT"

   b. Pratt & Whitney job data to appear on all sheets:

      (1) "P.O. NO.: "

   c. Tank data:

      (1) On each sheet indicate prominently the tank identification letter/number designation(s) for the tanks to which the sheet applies.

      (2) Number of tank(s) of each type to be furnished.

d. Manufacturer's name, address, drawing and/or sheet numbers, date of initial preparation and revision dates.

e. Space for United/Engineer action stamps (20 sq. in.).

4. Shop drawings shall be submitted on sheets no larger than 34" x 44". All drawings shall be folded to a size no larger than 8-1/2" x 11".

5. Shop drawings shall clearly indicate the following technical data for all tanks and related accessories specified herein:

   a. Dimensions, sizes, volumes, clearances, arrangements, details of construction, accessories, weights and tolerances

   b. Materials of construction for all components.

   c. Method(s) of fabrication (welding, weld preparations, nozzles, manways etc.), including a typical welding plan.

   d. Data on internal and external coatings including materials and methods of surface preparation and application.

   e. Standards or codes with which the product complies.

   f. Deviations from specifications or contract drawing(s).

   g. Tank labeling.

   h. Method(s) of protection of the interstice surfaces.

   i. Factory test methods to be used including as a minimum test pressures, test medium (air, water) and tests on coatings

   j. Method(s) of temporary storage.

6. Information on shop drawings that does not apply to this project shall be clearly indicated as not applicable.

7. United and the Engineer will stamp each submittal with a uniform, self-explanatory action stamp, appropriately marked and executed to indicate one of the following actions:

   a. No exceptions taken

   b. Make corrections noted

c. Amend and resubmit

d. Rejected

8. Review and return of shop drawings by United and the Engineer does not relieve the manufacturer from responsibility for errors or omissions which may exist, even though work is done in accordance with such drawings. United and Engineer do not assume responsibility for errors or omissions. Where such errors or omissions are discovered later, they shall be made good by the manufacturer irrespective of any review of United or the Engineer. Following return to manufacturer of drawings marked "No exceptions taken" or "Make corrections noted", no further changes will be considered without written application from manufacturer, and will not be allowed without written consent of United. Review of shop drawings does not apply to quantities, nor relieve Contractor of his responsibility of necessity of furnishing material, or performing work required by this Specification.

9. Before final payment is made for the tanks, shop drawings shall be corrected to reflect as-built conditions and one reproducible copy submitted to United.

B. Product Data:

1. Product data shall be submitted as appropriate to complement shop drawings; data shall be submitted in accordance with the Project Schedule. Product data includes manufacturer's standard printed information on the products to be furnished with data on recommendations for application and use, compliance with recognized standards of trade associations and testing agencies, and the application of their labels and seals (if any), or other special information.

2. Each product data submittal shall include an appropriate identifying cover or transmittal incorporating the same number of copies and the same information as specified for Shop Drawings (1.04A2 and 3).

3. Mark each copy to show which choices and options are applicable to the project. Where product data has been printed to include information on several similar products, some of which are not required for use on the project, or are not included in this submittal, mark the copies to show clearly that such information is not applicable.

4. Actions on product data by United and Engineer will be the same as for Shop Drawings (1.04 A7 and 8).

C. Samples

1. Three samples of each type of the coatings/linings to be furnished shall be submitted in accordance with the Project Schedule.

2. Each sample shall be tagged or labeled to identify the type of coating and tank(s) for which it is intended. Samples will not be returned.

3. Samples shall be physically identical with, and cured and finished in the same manner as the proposed material or product to be incorporated in the work.

D. Certifications

1. The manufacturer shall submit three copies of certifications of the following in accordance with the Project Schedule:

a. Design data and factory test results on tanks including, but not limited to:

(1) Tests of primary and secondary vessels

(2) Tests to verify electrical isolation of piping connections, manways, etc.

(3) Holiday tests on coatings, including all retesting if repairs are needed.

(4) Hardness test of outer coating.

(5) Adequacy of tank design to support the static and dynamic loads from the pumping equipment to be mounted on the pump nozzle.

b. Inspections at temporary storage sites and/or installation site:

(1) Verification that tanks have been properly placed in temporary storage prior to installation

(2) Verification that tanks have been properly installed in accordance with manufacturers instructions

2. The certifications shall be signed and attested by an officer of the corporation producing the tanks.

3. The certifications shall include all pertinent data on inspections, observations and tests to support the certification.

E. Instructions

1. The manufacturer shall submit, in accordance with the Project Schedule, six copies of written instructions covering shipping, loading/unloading, temporary storage, installation and operation and maintenance.

2. The shipping and loading/unloading instructions shall include all necessary preparations for the tanks, transport vehicles and hoisting equipment for shipping tanks from the factory and for transporting tanks from temporary storage to the installation site. The instructions shall include as a minimum:

   a. Preparations to tank such as nozzle protection, coating protection, venting, interior moisture control.

   b. Preparations to transport vehicle such as tank supports, tie downs.

   c. Lifting instructions such as use of lugs, required hoisting equipment, positioning on truck.

3. The temporary storage instructions shall include all necessary preparations for the tanks and the temporary storage site. The instructions shall include as a minimum:

   a. Preparations to tank such as nozzle protection, coating protection, venting, interior moisture control.

   b. Preparations at temporary storage site such as tank supports, tie downs.

4. The installation instructions shall include as a minimum:

   a. Inspections and tests required before placement of tank in the ground.

   b. Minimum bedding and backfill requirements, including precautions needed to protect coatings during placement of tank and placement and compaction of bedding and backfill.

   c. Special requirements for pipe nozzles and pump supports.

   d. Minimum hold-down requirements and installation of hold-down straps and tensioning.

   e. Inspections and tests after placement, during and after backfill and after final installation.

   f. Procedures for repairs to damaged coatings.

5. The operation and maintenance instructions shall include as a minimum:

   a. Periodic inspections and tests such as for detection of leaks and damage to linings.

   b. Liquid depth vs. volume charts for each tank.

1.05 <u>SUBSTITUTIONS AND DEVIATIONS</u>

This specification and accompanying drawings indicate manufacturer, model or type, or materials to be used as a standard for bidding purposes, and all bids shall be based on equipment and materials specified. If the manufacturer desires to use equipment or materials of a make or type other than those specified or shown on drawing, he shall name such in the Bid Proposal, together with deductions or additions to his base bid. If no such information is furnished, it is mutually agreed that equipment and material shall be furnished in accordance with these specifications and drawings.

1.06 <u>PROJECT SCHEDULE</u>

A. The overall project includes (1) purchase of tanks by United from the manufacturer and (2) installation of tanks by a contractor with services from the manufacturer as specified.

B. The manufacturer of the tanks shall be responsible for meeting the following schedule:

Completion of	Time for Completion (Calendar Days)
1. Initial Submittals	
a. Shop drawings, product data and samples	30 days after contract award
b. Installation instructions	45 days after contract award
c. Instructions for shipping, loading/unloading, temporary storage, and O&M	30 days prior to shipment of first tank
d. Certifications of factory test results	7 days prior to shipment of first tank
e. Signed warrantees of all tanks	7 days prior to shipment of first tank
2. Shipments	100 days after return of shop drawings marked "no exceptions taken" or "make corrections noted"
3. Submittals of certifications that tanks have been properly placed in temporary storage	7 days after each tank is unloaded at temporary storage site
4. Provide field services as required	Intermittently during a 60-day period in summer 1988
5. Submittals of certifications of proper tank installation	7 days after each tank installation

C. The actual installation work for the tanks will be performed by United under separate contract. The schedule for this work requires substantial completion by October 1, 1988. Consequently, the first tank will be installed about July 1, 1988 and the last tank must be installed by September 1, 1988. The manufacturer's responsibilities during the installation phase will require field visits for unloading, temporary storage, inspections and nominal supervision of installation. This will require field visits on a schedule which will foster timely completion of the project for compliance with regulatory deadlines. The manufacturer will be expected to be ready to provide this service as needed. The Bid Proposal shall include the necessary field services as specified in Para. 3.02.

1.07 NOTIFICATIONS

A. To maintain the Project Schedule notifications shall be made by the manufacturer to United (and received by United) as follows (time in parentheses is calendar days before the scheduled date):

1. Date on which preparation of the temporary storage area will begin (seven days).

2. Dates on which tank fabrication will begin, the tanks are being tested, and the tanks are ready for final inspection before shipment (seven days).

3. Dates on which each of the tanks will arrive at the temporary storage site (two days).

B. To maintain the Project Schedule the manufacturer shall respond to telephone notifications received from United within three calendar days to provide on-site services (in East Hartford, Rocky Hill or Wethersfield, CT) pertinent to and during installation of tanks as specified in Para. 3.02.

C. Notifications to United shall be made to:

William G. Winter
Pratt & Whitney
Plant Engineering (MS 102-18)
East Hartford, CT 06108
(203) 565-3120

D. Notifications to the manufacturer will be made to the person designated by the manufactrer.

2. PRODUCTS

2.01 GENERAL REQUIREMENTS

A. The drawings attached to this section list the underground horizontal cylindrical storage tanks to be furnished.

B. The tanks shall be of double wall construction for both the shell (360°) and the heads.

C. Except as otherwise specified herein, all tanks shall be designed and manufactured in accordance with NFPA 30 and UL-58.

D. All tanks shall be protected from external corrosion by use of coatings and cathodic protection systems as specified.

E. Tanks shall have internal coatings if so specified herein.

2.02 TANK DESIGN AND FABRICATION

A. The design of the tanks shall be based on NFPA 30 using the "atmospheric tank" definition. The tanks shall be double wall, horizontal, cylindrical for underground installation in accordance with NFPA 30. The design shall be based on UL-58, Type I tank with 360° double wall, and shall take into consideration that the maximum 10 psig bottom pressure specified in 2-3.2.4 of NFPA 30 may be exceeded; in such cases the design shall be based on the higher pressure and the testing shall be based on 2-7.2 of NFPA-30. The maximum bottom pressure shall be based on the maximum vent heights and specific gravities of fluids shown on the drawings except that a specific gravity of 1.0 shall be used for fluids with specific gravity less than 1.0.

B. All pipe connections to the inner tank shall be provided only through the covers of manway-type openings which are flanged and provided with electrical isolation.

C. The design shall take into consideration the possibility of a vacuum of 2" of water (gauge).

D. The nozzle supporting the pump shall have the attachment checked for adequacy. A pad will be required as a minimum.

E. Materials shall meet ASTM standards as follows:

   1. Plate: A-285C or A-283C
   2. Pipe:A-106B or A-53 seamless
   3. Screwed Fittings and Forgings: A-105
   4. Mill test reports for plate material shall be provided.

F. Shell cutouts for nozzles larger than 3" and for all manways shall have reinforcing pads of the same area and thickness as the shell replacing the area cut out.

G. All flanges shall be 150 lbs slip-on type with raised face per ANSI 16.5 except that plate flanges with minimum thickness of 3/8-inch may be used at the top of double wall manways and for the manway cover plates provided for tank access (Type 7 manways on sheet 2 of Drawings). Cover plates for manways with pipe penetrations or for supporting pumps shall have a minimum thickness as shown on drawings to permit drilling and tapping for attaching pipes or pumps.

H. The fabrication of the tanks shall be in accordance with UL-58. The tanks and all seams or joints shall be welded construction per UL-58. Certain details of design of nozzles and other accessories specified or shown on drawings may differ from UL-58; in such cases API 650, this specification and accompanying drawings shall take precedence.In Section 5 (shell seams) and Section 6 (heads and head joints) of UL58, shell joints of the inner tank shall be No. 1, No. 2 or No. 4 and head joints shall be No. 10, No. 11, No. 13, No. 14 or No. 23. Precaution shall be taken not to weld the two shells together and to avoid strikes and weld spatter. Manway and nozzle openings shall not intersect main shell seams.

I. All strikes shall be repaired and all weld spatter removed. For all tanks, inside surfaces shall be generally smooth to permit application of a coating whether or not such a coating is specified. Welds shall be ground smooth (maximum 1.5 millimeter projection from surface), both at the exterior surface of the outer tank and inner surface of the inner tank. There shall be no evidence of porosity, holes, high spots, pockets or undercutting. Fillet welds, if used, shall have a minimum 10 millimeter radius and blend smoothly into adjacent surfaces. Manholes or nozzles shall not project into tank. No sharp corners shall be permitted and inside edges of nozzles or manways shall be rounded to a 5 millimeter radius. No welding shall take place after application of coatings.

J. All tanks shall be fabricated with a one-eighth inch thick corrosion allowance on both shell and heads of the inner tank. This allowance shall be in addition to the steel thickness required under UL-58.Thicknesses specified herein or shown on drawings shall be interpreted to include the corrosion allowance.

2.03 MANWAYS AND NOZZLES

A. Manways and nozzles shall be sized and located as shown on the drawings. Manways and nozzles welded on the tanks shall be either of two classes as follows:

1. Double-wall extended nozzles - Double wall nozzles or manways extending to a flange 24 to 36 inches above the top of the tank with all tank penetrations, piping, pumps, etc. being made at a cover on the flange, there being no buried piping connected to the tank. (To be provided on all tanks except Q and R).

2. STI-86 containment system - Manways equal to those specified in STI-86, designed for installation of buried piping (To be provided on all manways on tanks Q and R and on one manway for access only on tanks S, T and U).

3. All double-wall extended nozzles or manways shall have double wall necks; each wall of the neck shall be of the same thickness as the corresponding inner and outer tank wall. The annular space of the manways and nozzles shall be continuous with the tank annular space (interstice) and no other fittings shall penetrate the inner tank. The tank design shall be such that vapors at the high points at each of the tanks can be released at the manways or nozzles without the need for special nozzles at the ends of the tanks.

4. The STI-86 containment system shall be constructed according to UL-58 and STI-P3 standards except that additional chamber height shall be obtained by fabricating the containment chamber extension of steel rather than using a fiber tube extension. The manhole cover on the tank shall be a 24-inch STI-86 manway, electrically isolated from the tank. Pipe fittings shall be standard steel fittings, FNPT, of the size indicated. The manhole cover on the containment chamber shall be a 30-inch STI-86 medium duty manhole. Cover shall contain two (2) 10-3/4" diameter, weatherproof covered hand holes. The STI-86 containment chamber shall include anodes for the protection of the extension using the STI-86 anode design for tanks S, T and U and the design specified in Para. 2.06 below for tanks Q and R. Tank manufacturer shall supply all tank fittings, sleeves, link-seals and couplings. Tank manufacturer shall coat the interior of the containment chamber, interior of the containment chamber extension and 24-inch manway with an approved STI-P3 coating, 10 mils DFT. The exterior shall be coated per para. 2.07. United will provide dip pipes and piping associated with the STI-86 containments.

B. The drawings indicate which tanks require provisions for mounting of a vertical turbine pump in the tank. Provisions for pump mounting shall be in accordance with the details shown on the drawings. The manufacturer shall clearly indicate (on shop drawings and/or in the certification of adequacy of design for pump support) the criteria, design and fabrication measures employed to insure adequate support for the pump, using the pump nozzle arrangement shown on the drawings. The drawings attached to this specification provide data on the weights and torques for the pumps to be installed by United.

C. All manways and nozzles shall have covers of the size and type indicated. Covers shall be electrically isolated from the tank by means of dielectric gaskets. Covers, gaskets, bolts, nuts and dielectric isolation shall be furnished and installed by the tank manufacturer such that all field connections will be electrically isolated from the tank. Gasket materials shall be suitable for and compatible with the fluid to be stored in each tank. Bolts and nuts shall be hex head. Covers weighing less than 100 pounds shall have two hand grips welded to the cover; heavier covers shall have 3 welded lifting lugs.

D. All penetrations through the covers on the nozzles or manways shall be in accordance with the arrangements shown on drawings. Pipe within the tank shall be schedule 80 carbon steel and shall be removable without the need for emptying or entering the tank. All pipe nozzles shall have either standard 150 lb. ANSI raised face flanges or NPT threads as indicated.Mounting bolts and gaskets for pipe nozzles attached to manway covers shall be furnished by the manufacturer but shall be shipped separately from the tank with proper labels or tags.Cover plates for manways shall be drilled and tapped as shown on drawings. Cover plates shall have minimum thickness to allow drilling and tapping without penetrating through the cover.

2.04 INTERNAL ACCESSORIES

A. Internal accessories shall be provided as specified or shown on drawings.

B. A striker/wear plate, seal welded to the tank bottom, shall be provided directly below each nozzle and manway. Each plate shall be at least six inches larger than the opening above it; each plate shall be at least one square foot in area and at least 0.125 inch thick.

C. Drop pipes shall be suspended from the nozzle and shall be of the size and length shown on drawings. Steel pipe shall be schedule 80 carbon steel.

D. Where shown on drawings, tanks shall be provided with a vertical, fixed type steel ladder from the access manway to the bottom of the tank.

E. Except for the drop pipes, which are to be removable through the hole provided, all internals shall be removable through the access manway provided.

F. Liquid level sensors and transmitters will be provided and installed by United. Manufacturer shall provide only the nozzles and drop pipes as shown on drawings.

2.05 OTHER ACCESSORIES

A. Other accessories shall be provided as specified or as shown on drawings.

B. A two-inch nozzle shall be provided for detection of leaks in the interstice between the tank walls. Probes and transmitters will be furnished and installed by United.

C. Lifting lugs shall be provided as required for loading/unloading operations for shipment, placement at the temporary site, transfer to the installation site and placement of the tank at the installation site. The tank shall be designed for all stresses imposed by lifting operations, using stiffeners to prevent distortion.

D. A hold-down system shall be provided for each tank, designed to withstand the uplift force on the tank when it is empty and the groundwater level is above the top of the tank. The manufacturer shall provide data on the design of size, material and location of anchor bolts for embedment in concrete ballast (bolts and ballast by United). Each system shall be complete in all respects and include the following as a minimum:

1. Straps, end connectors and turnbuckles.

2. Protection for tank external coating at strap locations.

E. After testing, the interstice between the tanks shall be charged with an inert gas with a specific gravity greater than air to a pressure of 2 psi and shipped with a pressure gauge in place.

F. Provide name plate mounted on a bracket near pump location. It should contain the following:

Name of manufacturer:
Manufacturer's Serial Number:
Date Manufactured:
Capacity:
Diameter and Length:
Pressure: None

Any other pertinent or required information may be added such as material of shell or maximum allowable head at bottom of tank.

2.06 CATHODIC PROTECTION SYSTEM

A. Each tank shall be provided with a galvanic cathodic protection system in accordance with STI-P3. The performance of the system shall meet the standards of the National Association of Corrosion Engineers (NACE) RP-02-85 for a minimum 30-year period.

B. Table 2.06-1 shows the minimum acceptable sacrificial anode requirements for 18 of the tanks included in this specification (Tanks A-1 & 2, B, C-1 & 2, D-1 & 2, E, F, H, I, J, K, L, M, N, Q, and R). These are tanks to be installed in areas where soil resistivity data are available.

Tanks not listed in Table 2.06-1 (Tanks G, O, P, S, T, and U) shall be provided with a galvanic-type cathodic protection system specified by the vendor, but consistent with STI specifications and the additional requirements of this Section 2.06.

TABLE 2.06-1 CATHODIC PROTECTION SPECIFICATIONS

Tank Size, Gallons	5,000	10,000	10,000	15,000	20,000	25,0000	30,000
Tank Designation	R	B,E,F,J, K,L,M,N	Q	H	C-1&2, I	D-1&2	A-1&2
Anode Description	(2)	(1)	(1)	(1)	(1)	(1)	(1)
No. of Anodes	2	8	2	8	12	16	20
No. of Anode Holes	2	4 (3)	2	4 (3)	6 (3)	8 (3)	10 (3)
Size of Anodes: Dia. x Length, inches	6 X 28	5 X 64	5 X 64	5 X 64	5 X 64	5 X 64	5 X 64
Total Anode Weight, lbs.	34	160	34	160	240	220	400

NOTES: (1) High potential magnesium anodes, Type 20D2.
(2) High potential magnesium anodes, 17# prepackaged.
(3) Two anodes shall be installed in each hole, one above the other.

C. For tanks Q and R, each STI-86 manway containment shall be cathodically protected using two 5 lb. prepackaged high-potential magnesium anodes.

Wire connections oriented 180° apart shall be provided on each containment chamber, one for each anode. The connections shall be electrically and mechanically sound. The wires are to be AWG #12 solid copper, insulated wires and will not be routed to the corrosion monitoring test station. These anodes are to be installed 3 to 5 feet away from the containment chamber, a minimum of 1 foot from any nearby metallic structure or appurtenance, and at a depth approximately equal to the elevation of the bottom of the containment chamber.

D. For tanks S, T, and U, each STI-86 manway containment chamber shall be provided with a galvanic-type cathodic protection system specified by the vendor.

E. The cathodic protection system shall operate in conjunction with an STI-approved exterior tank coating plus dielectric isolation fittings, selected in accordance with STI standards, for all piping and instrumentation connections.

F. The system for each tank must have a means of monitoring the cathodic protection potential and current.

G. For each tank listed in Table 2.06-1, the anodes used for the cathodic protection system shall be high-potential magnesium. The number and sizes of the anodes shall be sufficient to provide adequate cathodic protection levels as indicated in RP-02-85 for a minimum 30 year period. The high-potential magnesium anode(s) shall be electrically connected to the tank at the terminal block of a corrosion monitoring test station. The system shall also have the capability for future addition of supplementary anodes.

H. The wiring size, type, and any connectors, shall be indicated by the tank fabricator.

I. Within 30 days of installation, the corrosion control measures shall be verified as effective by a qualified corrosion technician or engineer retained by the manufacturer. The field test procedures shall be defined by an Accredited Corrosion Specialist (ACS) and the field results evaluated by the ACS who shall issue a written report on the effectiveness of the corrosion control measures. If the corrosion control measures do not conform to RP-02-85 and the local codes, the ACS shall prepare recommendations for upgrading the corrosion control system to accepted standards.

J. Dielectric isolating fittings shall be compatible with the operating temperatures (100°F max) and pressures for the tank. The materials of construction shall be suited for the product stored in the tank. Dielectric isolating fittings shall be used to prevent any electrical contact between the tank and piping associated with the tank. All piping (fill, suction, vent, control, gauge, etc.) shall be electrically isolated from the tank. Dielectric fittings must be indicated on the drawings provided by the tank fabricator. Instruction for preventing damage to the dielectric fittings during pipe installations shall be provided.

K. A means for providing monitoring of the corrosion control system shall be provided.

L. The minimum acceptable design for the tanks listed in Table 2.06-1 shall be as follows:

1. The monitoring system shall consist of two insulated AWG #10 solid copper wires connected to each tank. The connections must be electrically and mechanically sound. The wires shall be terminated on the terminal block of the corrosion control monitoring test station. One tank wire and the magnesium anode wire shall be interconnected by a calibrated shunt suitable to measure the current flows anticipated for cathodic protection.

2. The manufacturer shall provide a permanent reference cell designed for underground use to monitor the cathodic protection potential of each tank. Each reference cell shall be the copper-copper sulphate type. Each permanent reference cell will be placed by United at the approximate midpoint of the longitudinal axis of the tank, maintaining as much horizontal distance as possible from the two or four nearest anode locations, and placed 12-inches below the bottom invert of the tank.

3. Magnesium anodes shall be located so that the distance between any anode and the reference cell is a minimum of one tank diameter.

4. A minimum isolated AWG #14 copper wire shall be factory installed to the reference cell and shall run to the terminal block of the monitoring test station.

M. A monitoring test station shall be provided by the manufacturer to permit periodic verification of the corrosion control system. The test station shall be clearly identified (showing the item number of the associated tank), contain a terminal board and hardware for at least five wires, and be of a type commonly used for cathodic protection testing. Provision shall be made for the addition of a fifth wire of at least AWG #8 size into the test station. The wires must have sufficient slack to permit modifications or changes within the test stations. The test station will be installed by United.

N. The corrosion control system must be warranted by the supplier as suitable to meet the standards indicated in RP-02-85. The following shall be submitted to United for approval.

(a) Tank coating material plus surface preparation and coating application procedures.
(b) Coating defect repair materials and procedures
(c) Cathodic protection anodes: type, size and location.
(d) Dielectric isolation fitting locations and materials.
(e) Monitoring test station type
(f) System wiring details
(g) Accredited corrosion specialist certification
(h) Warranty for corrosion control measures

2.07 PROTECTIVE COATINGS

A. Internal and external coatings shall be provided as specified or shown on drawings. No coatings shall be applied until acceptable pressure tests have been completed.

B. The base bid shall be based on external coatings of all tanks applied and tested in accordance with STI-P3, dielectric epoxy or polyurethane and internal coatings for Tanks H and I as specified in 2.07 C below. Bid Alternate No. 1 shall be based on external fiberglass reinforced plastic (FRP) cladding of all tanks, including the exterior of STI-86 containments in lieu of STI-P3 coatings as specified in 2.07E below. Bid Alternate No. 2 shall be an additive alternate for coating of the interior of tanks A-1, A-2, C-1, C-2, D-1, D-2, E, O and P, as specified in 2.07F below.

C. External coatings under the Base Bid shall include the following surfaces:

1. Tank exterior.
2. Interstice monitoring pipe.
3. Exterior of double wall manways up to underside of top flange.
4. Exterior of STI-86 containment chamber extension.

D. The upper side of cover plates on double wall manways shall not be coated.

E. Under the Base Bid, the following coatings shall be applied and allowed to cure as follows for interior surfaces of tanks H and I and the lower surface of the manway covers on these two tanks:

1. Coating description: Two coats of Wisconsin Protective Coatings, Inc. Plasite 7111 epoxy-phenolic coating to a final dry film thickness of 12 to 14 mils.

2. Surface preparation, application, and curing of the coating shall be in accordance with Wisconsin Protective Coatings, Inc. Plasite 7111 Technical Bulletin.

3. The internal coatings shall be factory inspected and electrically tested for porosity, pinholes, and voids using a wet sponge, low voltage tester, 67.5 volts, 80,000 ohm resistance. Any defects (holidays) shall be repaired and retested.

F. Under the base bid, the coatings for the interior of modified STI-86 containments shall be per STI-86 and the exterior shall be the same as for the tanks.

G. Bid Alternate No. 1 shall be based on external fiberglass reinforced plastic (FRP) cladding of all tanks. FRP cladding shall be applied to the outer surfaces of the outer tanks and nozzles, including exterior of STI-86 containments. The FRP cladding shall be generally as specified in STI-P3 but shall be particularized or modified as follows:

1. After all connections and fittings have been installed, the exterior of tank nozzles, and manways shall be sandblasted free of scale, rust and foreign matter in accordance with the Steel Structures Paintings Council Specifications SSPC, SP6 (Commercial Blase Cleaning). Following sandblasting, the entire surface shall be brushed and vacuumed such that the surface when viewed without magnification is free of all moisture and foreign matter.

2. Within 8 hours after blasting, the exterior shall be coated with a base coat of resin 5 to 8 mils in thickness. Two layers of resin with fiberglass reinforcement shall be added to a thickness of at least 85 mils after hand rolling. A final coat shall be applied to a thickness of 10-15 mils. The thickness of the completed coating shall be a minimum of 100 mils after curing.

3. The coefficient of thermal expansion of the coating shall be compatible with steel so that stress due to temperature changes will not be detrimental to the soundness of the coating and a permanent bond between coating and steel is maintained.

4. The coating shall be of sufficient density and strength to form a hard impermeable shell which will not crack, wick, wear, soften or separate and which shall be capable of containing the product under normal service conditions in the event that the steel wall is perforated.

5. The coating shall be non-corrodable under adverse underground electrolytic conditions.

6. The coating shall be inspected for air pockets, blister, pinholes and electrically tested at 35,000 volts for coating shortcircuits. Any defects shall be repaired.

7. The coating shall also be checked with a Barcol Hardness Tester to assure compliance with the manufacturer's minimum specified hardness for cured resin.

F. Under Additive Bid Alternate No. 2, the following coatings shall be applied to the internal surfaces of Tanks A-1, A-2, C-1, C-2, D-1, D-2, E, O and P:

1. Coating description: Two coats of Valspar epoxy. The first coat shall be Valspar 78-D-7 (Buff) and the second coat Valspar 78-W-3 (White); each coat shall be 6-8 mils dry film thickness.

2. Surface preparation, application and curing of the coating shall be in accordance with Valspar Corporation Product Data Sheet 78 Series.

2.08 FACTORY TESTING AND INSPECTION

A. All tanks shall be factory tested as specified herein and/or as shown on drawings. The inner tank shall be tested before the outer tank is wrapped over the inner tank.

B. All tanks shall be inspected for proper welding, dimensions, positions, and fabrication of manways and nozzles and condition of coatings. The difference between minimum and maximum diameters (out-of-roundness) shall not exceed 1%.

C. The inner and outer tanks shall be proved tight against leakage in accordance with UL-58 (Section 11) and NFPA 30 (Section 2-7).

1. Test methods shall take into consideration the expected height of tank vent pipe and specific gravity of fluid as shown on drawings.

2. If the static head imposed at the bottom of the tank with a full vent pipe exceeds 10 psig, the test method of NFPA 30 Section 2-7.2 shall be employed.

3. It water is used in any tests, all free water shall be removed after testing and the surfaces dried prior to shipment.

D. Tests on coatings shall be as specified in Section 2.07 of this specification.

3.0 EXECUTION

3.01 DELIVERY

A. Scope

1. Delivery of tanks and accessories is defined to include all work necessary to place the tanks and accessories into temporary storage in an acceptable manner, including, but not limited to:

   a. Preparation of tanks for shipment
   b. Preparation of temporary storage site
   c. Transportation
   d, Unloading and inspection

2. All work defined as "delivery" shall be done in accordance with written instructions and/or shop drawings submitted in accordance with these specifications.

3. All work defined as "delivery" shall be included in the breakdowns for the Base Bid and for Bid Alternate No. 1.

B. Preparation of Tanks for Shipment

1. The manufacturer shall prepare all tanks for shipment to insure that the integrity of the tanks and coatings is maintained (1) during transportation to temporary storage; (2) while in temporary storage; and (3) during transportation from temporary storage to the installation site.

2. Piping for mounting on manway covers (vent nozzles, dip pipes) shall be shipped separately with proper tagging or labeling, indicating the tank and nozzle identifiers. Any other auxiliaries not factory-installed shall be similarly tagged or labeled.

3. Manways shall be covered to prevent mechanical damage and to prevent entry of precipitation, moisture, dust, animals, birds, insects or foreign material.

4. Tank shall be properly vented to maintain atmospheric pressure in the inner tank.

5. All accessories shipped unattached to the tank shall be properly boxed (or otherwise protected as necessary) and then labeled as specified above.

6. Exposed male pipe threads shall be provided with temporary pipe caps.

7. Labeling shall be in accordance with the shop drawings.

C. <u>Preparation of Temporary Storage Site</u>

1. The manufacturer shall prepare the temporary storage site in a manner which facilitates tank delivery and provides suitable protection of the tanks against adverse climatic conditions (wind, rain, snow, ice, etc.) during the temporary storage period (see Project Schedule, Paragraph 1.06). These preparations shall be in accordance with written instructions furnished by the manufacturer.

2. The preparation of the site shall not begin until authorized in writing by United (see Notifications, paragraph 1.07).

3. The location of the temporary storage site is in a deteriorated paved area on the Pratt & Whitney site in East Hartford, CT located where shown on Attachment A.

D. <u>Transportation</u>

1. The manufacturer shall schedule and arrange for all transportation of tanks to the temporary storage site. This shall include arranging for and obtaining permits for special highway usage.

2. Notifications shall be made prior to delivery of tanks in accordance with Paragraph 1.07.

E. <u>Unloading and Inspection</u>

1. The supplier shall schedule and arrange for all equipment and manpower to unload the tanks from transportation vehicles at the temporary storage site.

2. The unloading operations shall be supervised by a qualified

representative of the manufacturer.

3. The unloading operations shall be conducted in a manner which provides reasonable protection against damage to the tanks and accessories.

4. During unloading operations the manufacturer's representative shall conduct a thorough visual inspection of the exterior of each tank.

5. After placement in position at the temporary storage site the manufacturer's representative shall:

   a. Inspect the interior of each tank for the presence of water or other foreign material and condition of interior coatings.

   b. Inspect the conditions of storage for each tank.

   c. Report the results of inspections to United.

6. Any deficiencies found in the inspections in 4. or 5. above shall be corrected and the inspections repeated.

7. The manufacturer shall submit a certification that the tanks and accessories have been properly placed in temporary storage.

F. <u>Acceptance by United</u>

1. The delivery of each tank will be accepted by United in writing within seven calendar days after receipt of the certification that tanks have been properly placed in temporary storage.

3.02 <u>INSTALLATION</u>

A. <u>Scope</u>

1. The manufacturer shall be responsible for providing necessary services pertinent to and during installation of the tanks including the following:

   a. Submittal of written instructions for loading/unloading, transportation, inspections and tests and installation.

   b. Periodic on-site services by a qualified representative to observe procedures and supervise inspections and tests.

2. All services by the manufacturer during installation shall be in accordance with the Project Schedule, paragraph 1.06.

3. Except as otherwise specified herein, the actual installation work will be conducted by others under contract to United.

4. The Base Bid and bids for any Alternates shall include these services.

B. Services Related to Installation

1. The scope of the required written instructions, their content and schedule of submittals are covered in Paragraphs 1.04E and 1.06.

2. The manufacturer shall provide periodic visits to the installation site by a qualified representative. These visits will be for the purpose of observing installation and test procedures for compliance with written instructions, including but not limited to:

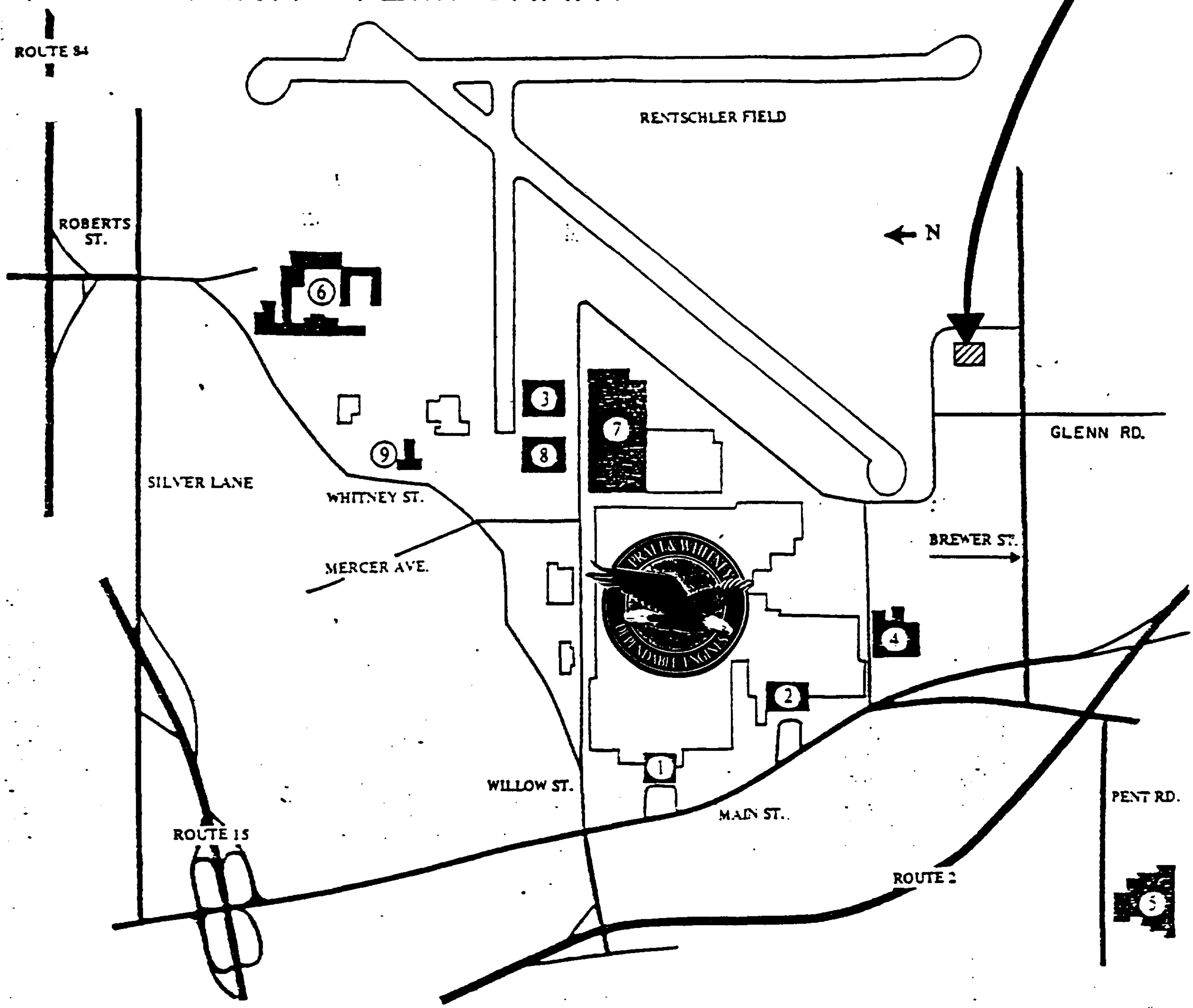
   a. Witness testing of dielectric isolation.

   b. Arrange for testing of cathodic protection.

   c. Witness field pressure testing of tanks.

   d. Witness holiday tests of coatings.

TANK TEMPORARY STORAGE SITE



1 - Main Administration Building
2 - South Administration Building
3 - Office Building "B" (OBB)
4 - Engineering Building
5 - Willgoos Lab
6 - United Technologies Research Center
7 - "L" Building
8 - Office Building "G" (OBG)
9 - Rentschler Airport

UNITED TECHNOLOGIES

Attachment A - P&W EH Underground Tank Purchase

APPENDIX D

Designation	Title	Content
D-5	Concentrated Waste Treatment Plant-Process Schematics	1. Alkali, zyglo, cyanide & PS-644 2. Oils & solvents 3. Mixed Acid 4. Chrome

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Image Target Sheet

RDMS Document ID # 2561

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Facility ID#: CTD990672081

Phase Classification: R-1B

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Description of Oversized Material, if applicable:

APPENDIX D-5, SHEET 1 OF 4: PROCESS SCHEMATICS, ALKALI, ZYGLO, CYANIDE & PS-644

[X] Map [ ] Photograph [ ] Other (Specify Below)

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Description of Oversized Material, if applicable:

APPENDIX D-5, SHEET 2 OF 4: SCHEMATIC -OILS & SOLVENTS

[X] **Map** [ ] **Photograph** [ ] **Other** (Specify Below)

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Description of Oversized Material, if applicable:

APPENDIX D-5, SHEET 3 OF 4: SCHEMATIC - MIXED ACID

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Purpose of Target Sheet:

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[ ] Page(s) Missing (Please Specify Below)

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Description of Oversized Material, if applicable:

APPENDIX D-5, SHEET 4 OF 4: SCHEMATIC -CHROME

[X] Map [ ] Photograph [ ] Other (Specify Below)

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APPENDIX D

Designation	Title	Content
D-6	Site Plan -Buried Piping & Utilities	Shows all buried piping and utilities at CWTP site

US EPA New England
RCRA Document Management System
Image Target Sheet

RDMS Document ID # 2561

Facility Name: PRATT & WHITNEY - MAIN STREET

Facility ID#: CTD990672081

Phase Classification: R-1B

Purpose of Target Sheet:

[X] **Oversized** (in Site File)   [ ] **Oversized** (in Map Drawer)

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[ ] **Privileged**   [ ] **Other** (Provide Purpose Below)

Description of Oversized Material, if applicable:

APPENDIX D-6: SITE PLAN, PIPING AND UTILITIES

[X] **Map** [ ] **Photograph** [ ] **Other** (Specify Below)

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APPENDIX D

Designation	Title	Content
D-7	Maxium Container Storage Capability	Shows various arrangements for storage of containers

US EPA New England
RCRA Document Management System
Image Target Sheet

RDMS Document ID # 2561

Facility Name: PRATT & WHITNEY - MAIN STREET

Facility ID#: CTD990672081

Phase Classification: R-1B

Purpose of Target Sheet:

[X] Oversized (in Site File) [ ] Oversized (in Map Drawer)

[ ] Page(s) Missing (Please Specify Below)

[ ] Privileged [ ] Other (Provide Purpose Below)

Description of Oversized Material, if applicable:

APPENDIX D-7: MAXIMUM CONTAINER, STORAGE CAPABILITY

[X] Map [ ] Photograph [ ] Other (Specify Below)

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